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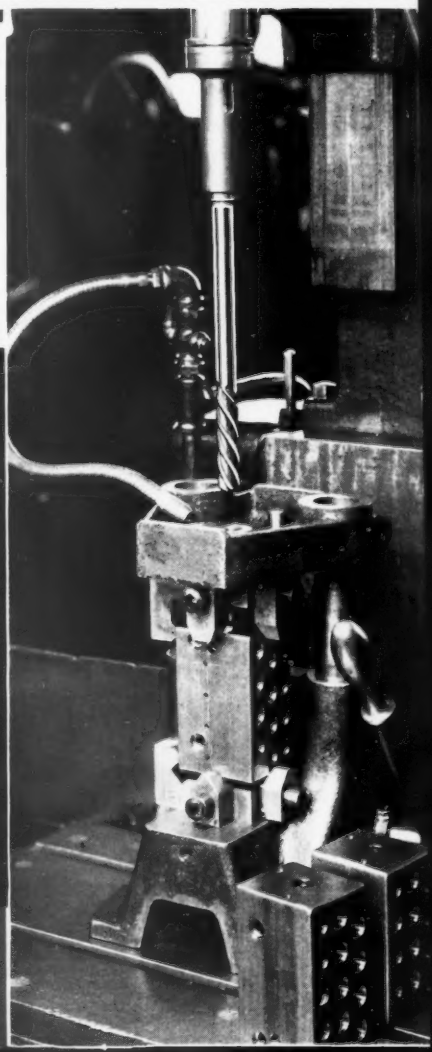

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Editor George J. Huebner

Assistant Editor Paul L. Reed

Official Organ of the Special Tool, Die and Machine Shop Institute

Vol. 6 DECEMBER, 1940 No. 9

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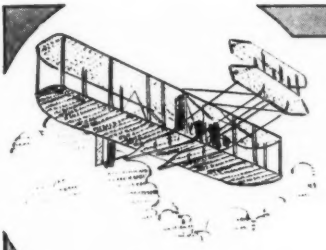

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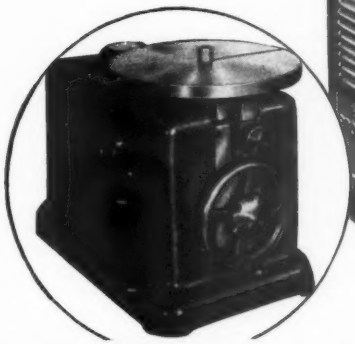

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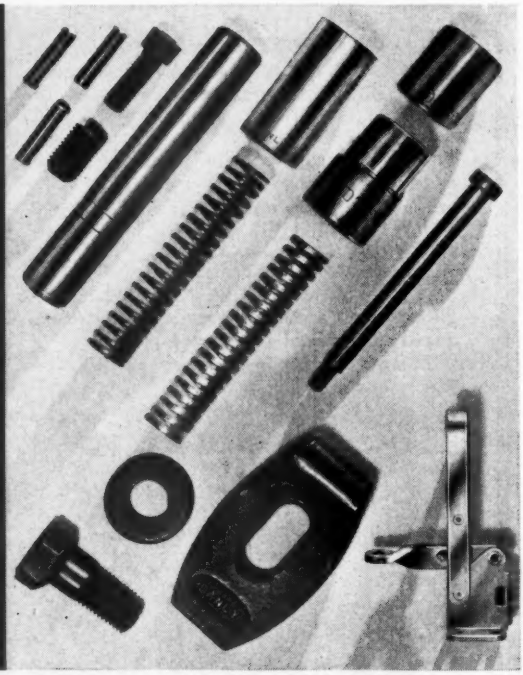

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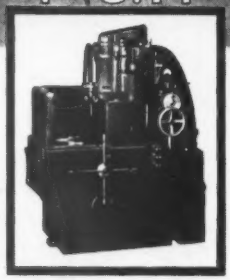

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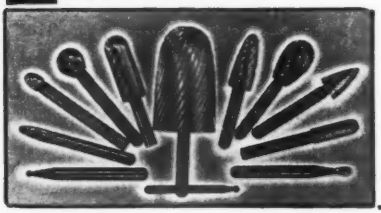

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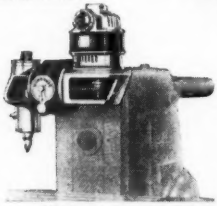

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The National Tool and Die Journal
DECEMBER, 1940 Vol. 6, No. 9

PLASTIC MOLD DESIGNING

By GORDON B. THAYER
Plastic Design Engineer
General Industries Company

Article X of a Series

Methods of Mold-Sinking

Hobbing, Milling

IN drop forging practice, the process of forming the die cavity is called die-sinking. Because it was decided to standardize in this series, and use the term *mold* for plastics, mold sinking will be used to indicate forming of the molding portion of plastic molds. Three methods of mold sinking are important to the tool room and die shop and a fourth and fifth method are somewhat dependent upon the toolmaker, although he does not actually do the operation of forming the cavity.

The principal methods of mold sinking are hobbing, milling and duplicating. In the first method hobs made in a tool room or machine shop are sunk into the cavity blocks. Cavities and forces can be machined directly either by the geometric control of a milling machine or by the duplicator which follows the contour of a master model. Mold cavities are also formed by casting a non-ferrous alloy such as beryllium copper around a master, and by an electroplating process, which also uses a master. These masters are made according to the usual procedure in making hobs. After casting, or electroforming, the finishing touches are performed by the toolmaker, and these operations are the same as if the mold is built by the older machining methods.

Hobbing

Hobbing is a process of forming a mold cavity by forcing a hardened steel master of the same shape and substantially the same dimensions as the molded part desired into a soft steel cavity blank, which is subsequently trimmed to size, carburized, hardened and polished. This hobbing operation is performed at room temperature, in a hydraulic press. Auxiliary equipment essential to hobbing includes steel blocks of various

heights to support the work in the press and an assortment of different standard sizes of chase rings to confine the hobbing blank laterally to force the steel in the blank to flow upward and remain tight against the hob.

A circular chase is shown in Fig. 19. Rectangular chases are also used. Two or three sizes of each shape are usually provided. The hole in the chase is tapered as shown, and the blanks are shaped to fit the taper. As the press closes, the blank is forced into the taper and the flowing metal is forced against the sides of the hob.

The hob itself is made of air hardening or water hardening tool steel, as preferred by the experience and judgment of the toolmaker. It is made to the dimensions of the part to be molded, with shrinkage allowance added. Since the metal in the blank will not fit up dead to the hob a slight allowance is sometimes made all around the outside for this run-away. The hobbed cavity is cold-worked by the hobbing, and hence is under stress when it comes from the press. Some of this stress is relieved in trimming the excess metal away, and the rest is relieved in the annealing incidental in the carburizing treatment. This causes the cavity to shrink or expand, depending upon the shape of the cavity, and this amount is unpredictable, unless figures for other similar jobs are available. Usually no definite allowance can be made for this discrepancy; the toolmaker must aim at having a few thousandths to polish away after the mold is hardened.

self-explanatory notes. Fig. 21 is a diagram of a hobbing set-up.

Fig. 18 shows a hob and its cavity. This hob was made on a 1500 ton hobbing press in the shop of a large bakelite molding plant.

The cavity blank is usually received in the annealed state, and requires no other preparation than shaping the taper to fit the chase, and polishing the top surface where the hob is to be placed. Any scratches on this surface will not be ironed out in hobbing, but will remain in the cavity. It is much easier to polish a plane surface where it is easy to reach than to polish scratches in the cavity.

Mold cavities which are difficult to engrave or mill on account of small radii and irregular curves are easily sunk by hobbing. Making the hob resolves into making a model of the piece to be cast. The engraving is done on the outside surface which is easy to reach. Sometimes it is practically impossible to machine a casting "inside out" and in such cases the hob is indispensable.

When the outline of a part which is symmetrical above and below the parting line is irregular in outline in the parting plane, a hob is useful to sink upper and lower parts of the cavity to insure a good match. When it is necessary to make a large number of cavities, a hob is economical and insures uniformity of castings both in appearance and in volume, which is perhaps more important from the molding standpoint. When raised letters or designs are required in the mold cavity a hob may be used to produce them quickly. Such lettering

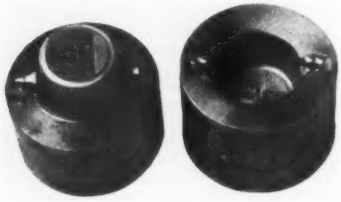
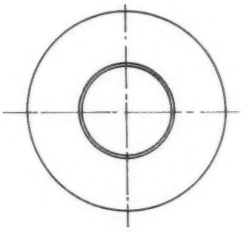


Fig. 18 — A hob and its cavity. This type of design with a "coin" edge and engraving is particularly suited to hobbing. Photo courtesy: French Oil Mill Machinery Company.

The finished hob is given a high polish after hardening and the quality of the polishing is reflected in the cavity. For a lubricant, the hob is copper plated by applying a coat of blue vitriol to the surface. Fig. 20 shows a hob with some

should not be too narrow, nor too high, because the metal will not flow up into a confined space. Lettering cannot be hobbed very successfully on a sloping surface as the metal flowing along the slope will either shear off if the letters



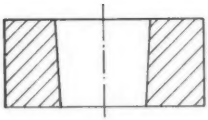
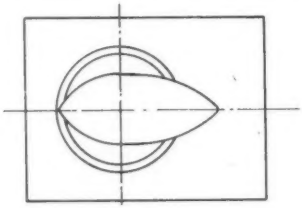


Fig. 19 — Hobbing Chase

The bore is tapered all around, approximately 3°, to force the metal in the blank to hug the hob. The ring is rather massive in proportion to the hole.



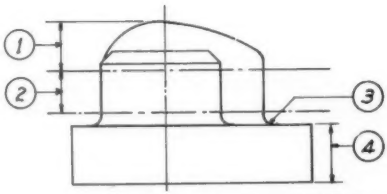


Fig. 20 — Diagram of a Hob

1. Impression portion — polished.
2. Shank to allow deeper sinking than required by impression.
3. Radius.
4. Shoulder for convenience in removing hob.

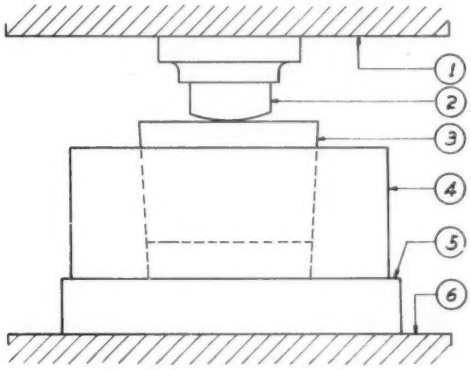


Fig. 21 — Hobbing Set-Up

1. Upper platen of press.
2. Hob.
3. Cavity blank.
4. Chase.
5. Spacer blocking.
6. Lower platen of press.

are raised in the mold, or raised letters on the hob will shear. Sometimes cavities are hobbed with a hob which is not an exact replica of the casting desired and the rest of the cavity is turned or milled to completion. An example is the case of a round knob in which the molding portion is hobbed, and the material well is turned. When it is desired to have a cavity of tool steel, only very simple hobbing may be done which requires a minimum of metal flow. An arrow, or a line, or a monogram may be

(Continued on Page 42)

Die Designing and Estimating

By CHARLES BOHMER
and
GEORGE DANNES

Article VIII of a New Series

With this article we close the present series of joint analyses of designing and estimating by Charles Bohmer and George Dannes. The method of estimating used throughout this series is fully described in "Die Designing and Estimating" (Advanced Series).

A limited number of back copies of some issues in which these articles appeared are still available.

—The Editor.

Design and Estimate of a Progressive Notch, Pierce, Form and Cut-Off Die

Analysis of Design and Application of Method for Estimating Time Required to Machine and Assemble Parts

Design

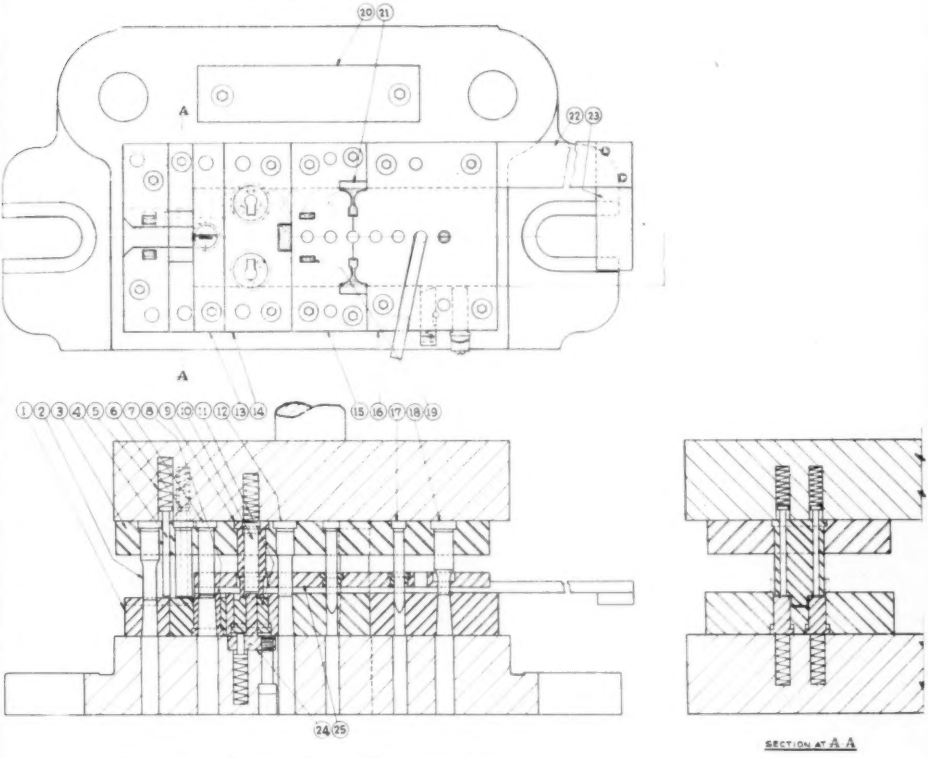
WHEN production volume runs into great numbers, progressive dies warrant investigation because of the tremendous savings possible through their use.

The die as illustrated is used to make great quantities of Valve Operating Knobs with a single handling of strip material.

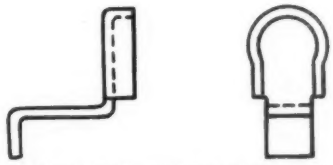
In all progressive dies each station has a definite purpose and it is necessary to construct the die in such a way that maintenance is an easy matter both in sharpening and replacement of parts.

The die under present consideration makes two complete parts at each stroke and operates as follows: The strip of material is fed into the die up to the primary stop and the pilot hole piercing is made; the next three stations are idle-located by the automatic stop and the pilot (17) which will control the exact locations for the entire length of the die along with the pilot in the sixth station from the left. After the first piercing and idle positions, successive operations are notch, pilot, notch, notch, idle, form, idle, part, form up and down, idle and cut-off resulting in two parts at a time per stroke thereafter for the length of the strip.

The lower part of die or the die proper is a sectional build-up divided and spaced as illustrated and made of hardened tool steel. The upper part of the die or punch assembly consists of a soft machine steel pad (3) into which all the perforators and punches are inserted. The stripper which is mounted permanently on the die is the conventional solid stripper with hardened steel bushings inserted to guide the pilots (17) to assure greater accuracy.



Section on Center Line of Die Assembly



Valve Knob .025″ Stainless Steel

Fig 54. Progressive Notch, Pierce, Form and Cut-off Die Designed by E. Taylor, Courtesy: Federal Tool Corp., Chicago

As will be noted from the part drawing, the rounded upper section is flanged and the general shape or form is that of a crank. This forming is accomplished in the final stations of the die. The exact shape of the blank before forming, however, must be previously determined so that the size and position of the notching openings can be designed. The method in which the forming is done is well illustrated (9-10-11-24) and consists of a lower punch and pad and an upper die and pad. From this form, the blank is carried over and separated and then formed up and down into the crank shape. This forming is accomplished by an upper punch and a lower pad and die, the blank held securely by upper spring

pins before forming. From this station the blank is fed forward and cut off.

Since the die is designed to make two parts at a time the sections are the same in front and back and the large center piercing made at the start acts as a pilot for the entire strip.

In the construction of progressive dies several principles must be maintained at all times: all successive stations must be properly located; pilots are to be used to establish the accurate position of the material; enough space must be allowed between stations so that the die is not crowded; when forms are made, clear passage must be made for that form; stripping must be positive so there is no danger of possible jams in operation; all pilots must align properly with the back gage and a bumper block is always needed to determine the correct depth of punch into die and help prevent any possible slip or mistake in the set-up when going to press.

Since there are always a great number of uncertainties in a complicated progressive die it is sometimes impossible to visualize them all when designing the die. However it is well to keep in mind the fact that when there are any questionable points in any of the stations to allow enough room in between so that changes or corrections can easily be made.

Estimate

MACHINING AND GRINDING

Column A—for time values see Table, Fig. 6

	Machining hr.	Grinding hr.
DIE—Det. 16—1" x 3½" x 4¼" TS	.6	.8
DIE—Det. 15—1" x 1¾" x 4¼" TS	.5	.7
DIE—Det. 14—1" x 1¾" x 4¼" TS	.5	.7
DIE—Det. 13—1" x 1½" x 4¼" TS	.5	.7
DIE—Det. 1—1" x 1¼" x 4¼" TS	.5	.6
PUNCH—Det. 21—¾" x 1" x 1¾", 2 required TS	.6	.8
PUNCH—Det. 12—¾" x 1" x 1¾", 1 required (No machining or grinding time required for rest of punches)	.3	.4
PUNCH PAD—Det. 3—¾" x 4" x 7¾" CRS (70%)	.6	.4
STRIPPER—Det. 25—½" x 4¼" x 6" CRS (70%)	.4	.3
BACK GAGE—Det. 22 and STOCK REST—Det. 23 (No machining required)		
STOP BLOCK or BUMPER—Det. 20—1¼" x 2½" x5¾" CRS (70%)	.5	
	5.0	5.4
TOTAL Column A		10.4 hrs.

DRILLING ALL HOLES EXCEPT FOR PERFORATORS AND PILOTS

Column B—for time values see Table, Fig. 7

DIE—Det. 16—4 screws, 2 dowels	.7 hr.
DIE—Det. 15—4 screws, 2 dowels	.7
DIE—Det. 14—2 screws, 2 dowels	.5
DIE—Det. 13—2 screws, 2 dowels	.5
DIE—Det. 1—2 screws, 2 dowels (No screws or dowel holes for PUNCHES as all are inserted in PUNCH PAD)	.5
PUNCH PAD—Det. 3—4 screws, 2 dowels	.7
STRIPPER—Det. 25—4 screws, 2 dowels	.7
BACK GAGE—Det. 22—2 screws, 2 dowels, 2 rivets	.7
STOCK REST—Det. 23—2 rivets	.3
STOP BLOCK—Det. 20—2 screws	.3
DIE SHOE—4 screws, 2 dowels for Det. 16 4 screws, 2 dowels for Det. 15 2 screws, 2 dowels for Det. 14 2 screws, 2 dowels for Det. 13 2 screws, 2 dowels for Det. 1 2 screws for STOP BLOCK —Det. 20	2.7
PUNCH HOLDER—4 screws, 2 dowels for Det. 3	.7
TOTAL Column B	9.0 hrs.

(Continued on Page 26)

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The Design and Construction of Typical Drill Jigs

By E. G. Marshall

Assistant Superintendent
Pittsburgh Screw and Bolt Corp.
Prebble Avenue Plant

Part Three

Drill and Pin Jig, Boring Fixture, Drill Jig

FIGURE 21 is a drawing of a drill and pin jig with all the clamps operated by one screw. The arms A, B and C are made a wringing fit on the shaft D. The assembled shaft is placed in the "V" blocks E, F and G and the clamp H tightened lightly to hold the shaft in place. The arm B is moved to its correct position and the locating pin I entered in the hole in the arm. The same is done with arm C and pin J. The arm A has no hole in the end, but has a flat surface which rests on the pin K and is clamped down on this pin by the eccentric pin L. After the arms are located in place, the clamp H holding down the shaft is tightened securely. The lid M is swung over the work and brought to rest on top of pin N. The lid is held down only by its own weight. The bushings O are for a drill the size of the small end of a taper pin. The holes are drilled, then the lid is swung back and the holes are taper reamed to suit the size of the pin and the pin driven very lightly in the shaft. The pins are driven tight after the work is removed from the jig.

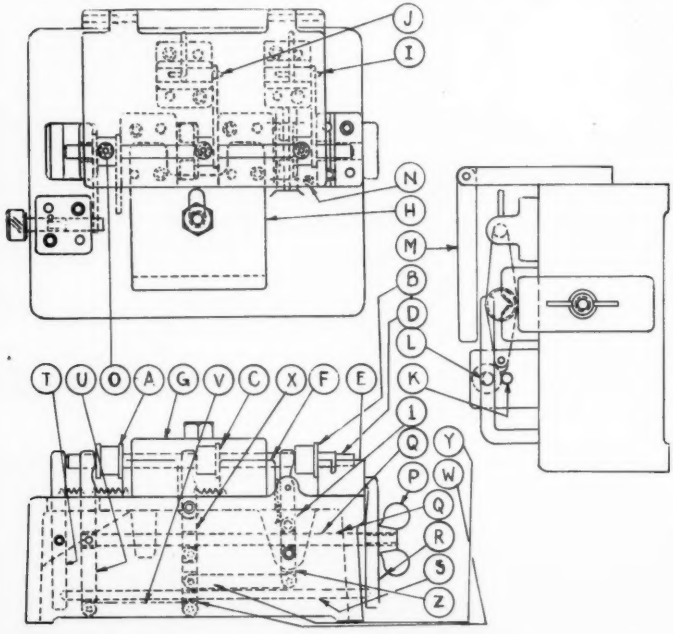
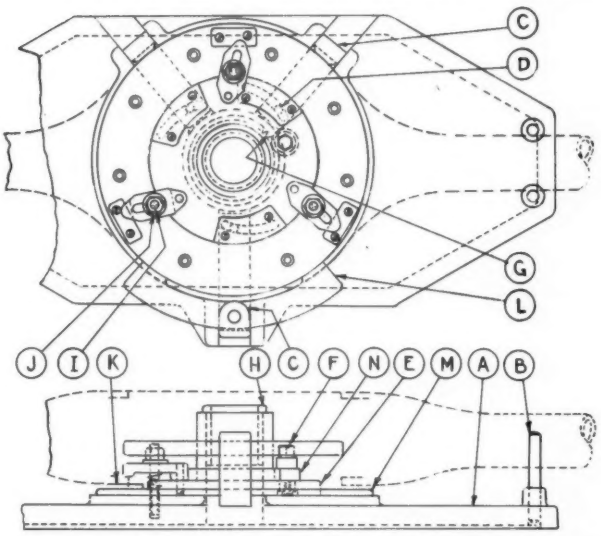


Fig. 21

The clamping of the different parts with the one thumb screw is accomplished by the following method: the thumb screw P is turned to the right on the rod Q. This movement moves the clamp R in toward the jig casting. The top of

Fig. 22



the clamp limits on the locating block E and the bottom moves in, causing the rod S to move to the left. Continued turning of the thumb screw causes the rod S to move the bottom of the clamp T to the left and the top to the right. This pushes the shaft to the right against the locating shoulder in block E. When the shaft limits in the block the moving parts previously mentioned become rigid and the thumb screw pulls the rod Q to the right. The left end of this rod is attached to the clamp U so that as the rod Q moves to the right the clamp U moves with it as a unit. The top forces the arm A against the locating block G and limits there. The bottom end continues to move to the right and moves the link V with it. The link V moves the bottom end of W to the right and the top to the left. The top of W moves the bottom of clamp X to the left and the top to the right. The top of X forces the arm C against the block and limits there. Continued movement of V to the right now moves all of W to the right. This moves the link Y to the right. The link Y moves the bottom of Z to the right and the top to the left. The top of Z moves the bottom of No. 1 to the left and the top to the right. The top of No. 1 forces the arm B against the locating block and limits there. Continued pressure on the thumb screw now serves only to clamp the work tighter. By this method all parts are clamped with even pressure. The springs shown are used to move the clamps away from the work when the thumb screw is turned backwards.

Fig. 22 is a drawing of boring fixture for the rear axle housing of an automobile. It is designed to be used in any heavy duty drill press of sufficient capacity. The fixture is clamped on the drill press table with the drill press spindle in line with center bushing of the fixture. The boring tool head which is attached to the spindle is piloted in the center bushing.

A is the cast base of the fixture. The pins B are used to roughly locate the work before the final locating and clamping. The final locating is done by the locators C. A pin D driven in the locator moves in a slot in the cam ring E. This ring is operated by a gear stud attached to it and meshing with the ring gear G attached to the center boss of the casting. This center boss also contains the pilot bushing H to pilot the boring tool.

When the cam ring draws the locators in tight against the outside of the housing, the work is clamped. The clamps I are slid by the gear ring over the lower rim of the housing and the nuts J tightened.

In designing a fixture of this type to be used on a specific machine, the size of the machine has to be checked first. Then analyze the job and plan how it is to be done. After that draw the work to be done in at least two views. Then draw in the rest plates K and the locators. One locator has a swinging clamp L for distributing the load to prevent any dis-

tortion of the housing. The design of the cam ring and gears is part of the design of the locators.

Then draw in the clamping mechanism. Then finish the casting, dimensions, etc., and the jig is designed. Some designers may object to drawing the casting last, but the author over several years experience in designing has found that less changing and redrawing is necessary if all designs were made in the following procedure: draw in the work, the location, the clamps, the drill bushings if any, and last the casting. There will be exceptions to this rule.

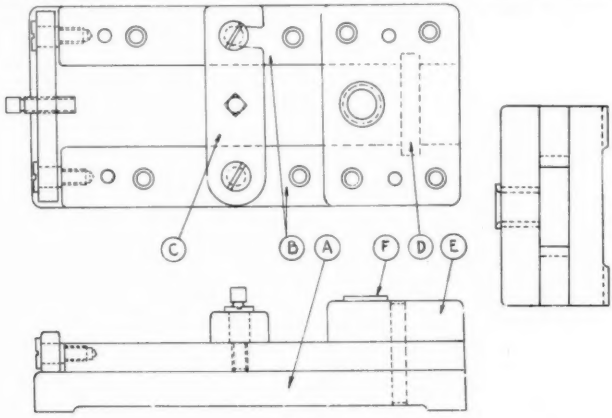


Fig. 23

The toolmaker should start in by machining the base casting. Due to the large size of this casting it is turned bottom side up on a planer and the flat bottom surface done first. The job calls for very careful leveling up and clamping. The finish lines in the bosses and bottom should be laid out, then the finish line on the bottom leveled up to be parallel with the bed of the planer. The layout also shows whether there is enough finish on all bosses and how much the casting warped in cooling. After machining, inspect the finished surface for straightness and flatness. Then turn the casting over and clamp right side up on a vertical miller and face the top for the rest plates. The rest plate is the circular plate or washer M. Then mill the slots for the locators in the vertical miller.

The rest plate M is made in a large lathe. Use tool steel so it can be hardened and ground. It is not necessary to maintain a location of this plate with the use of dowels. The plate should be surface ground after hardening to keep it perfectly flat.

The locators should next be shaped. They should be made of tool steel so they can be hardened. The pin hole should be drilled and reamed for the dowel pin that is driven by the cam ring. The dowel pin should be a sliding fit in the casting under the rest plate.

The cam ring can be made next. It also should be made of tool steel and hardened and ground. It should be a free fit inside the rest plate. The angle on the cam slots should be alike so the locators will move in evenly.

The gear stud can be made and attached to the cam ring as shown at F, Fig. 22. The ring gear N is made to press fit over the center hub of the casting. It also fits over the cam ring to prevent its raising up. This gear can be made of mild steel and cyanide hardened for wear.

Fig. 23 is a drawing of a drill jig to drill a hole in the end of a rectangular piece of steel, which is afterwards turned to make piercing punches used in forging machines. Due to the accuracy of alignment required, the flat sides, the edges and the back end must be square and parallel within very close

(Continued on Page 40)

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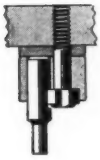

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Progressive Notch, Pierce, Form and Cut-Off Die

(Continued from Page 20)

LAYOUT AND INSPECTION

Column C—for contour time values see Tables, Figs. 9, 10, 11, 12

Layout

DIE—Dets. 16 and 15	3.8 hrs.
DIE—Det. 14	.7
DIE—Det. 13	1.0
DIE—Det. 1	1.7
FORM PAD—Det. 11	1.0
INSERT—Det. 8	.4
	8.6 hrs.

MATERIAL LIST

Det.	Req.	SIZE & MATERIAL	Remarks
1	1	1″ x 1¼″ x 4¼″ PIERCING DIE TS	
2	2	⅝″ DIA. x 2½″ PIERCING PUNCH DR.	
3	1	¾″ x 4″ x 7¾″ PUNCH ASSEMBLY PAD CRS	
4	2	SPRING PINS	
5	2	SPRINGS TO SUIT	
6	2	SPRING PINS	
7	1	½″ DIA. x 2½″ PUNCH DR.	
8	1	INSERT	
9	2	FORM PUNCH	
10	2	SPRING PAD	
11	2	1″ DIA. x 1¼″ FORM PAD DR	
12	1	¾″ x 1″ x 1¾″ PUNCH TS	
13	1	1″ x 1½″ x 4¼″ DIE TS	
14	1	1″ x 1¾″ x 4¼″ DIE TS	
15	1	1″ x 1¾″ x 4¼″ DIE TS	
16	1	1″ x 3½″ x 4¼″ DIE TS	
17	4	⅜″ DIA. x 2½″ PILOTS DR	
18	1	⅝″ DIA. x 2¼″ PERFORATOR DR	
19	2	⅝″ DIA. x 2¼″ PUNCH DR	
20	1	1¼″ x 2½″ x 5¾″ STOP BLOCK OR BUMPER CRS	
21	2	¾″ x 1″ x 1¾″ PUNCH TS	
22	1	¼″ x 1″ x 12″ BACK GAGE CRS	
23	1	¼″ x 1″ x 3″ STOCK REST CRS	
24	2	1½″ DIA. x 1½″ FORMING INSERT TS	
25	1	½″ x 4¼″ x 6″ STRIPPER CRS	
26	1	¾″ x 2″ x 2½″ FORM PUNCH TS (Section A-A)	

Inspection

DIE—Dets. 16 and 15 = 3.8 hrs. + .5 hrs. for each die opening (4)	5.8 hrs.
DIE—Det. 14—1 opening	1.2
DIE—Det. 1—2 openings	2.7
FORM PAD—Det. 11—2 required	2.0
INSERT—Det. 8	.9
	12.6 hrs.
TOTAL COLUMN C	21.2 hrs.

MACHINING, FINISHING AND FITTING DIE PARTS

Column D—use contour units as established for Column C, also Drawings and Tables, Figs. 13-20

	Machining hr.	Finishing hr.
DIE—Dets. 16 and 15—2 openings, 12 units, size 4	16.0	1.8
2 openings, 4 units, size 1	8.0	.8
DIE—Det. 14—1 opening (see Fig. 19), 3 units, ¾ sq. inch deep	.6	
DIE—Det. 13—2 openings (see Fig. 19), 3 units each, ½ sq. inch x 1″ deep	1.2	
FORM PUNCH—Det. 9—5 units, size 1, 2 required	8.0	.8
DIE—Det. 1—2 openings, 4 units each, size 1	8.0	.8
1 opening (see Fig. 19), 7 units, 1 sq. inch x ¼″ deep	1.2	
FORM PAD—Det. 11—5 units, size 1, 2 required	8.0	.8
INSERT—Det. 8—4 units, size ½, 1 required	5.0	.4
PUNCH—Det. 21—12 units, size 4, type 2, 2 required	21.6	
PUNCH—Det. 19—4 units, size 1, 2 required, DR PUNCH	5.8	
PUNCH—Det. 12—4 units, size 1, type 1	2.0	
PUNCH—Det. 24—5 units, size 1, type 2, 2 required	9.6	
PAD—Det. 10—5 units, 2 required, DR	5.8	
PUNCH—Det. 7—4 units, size 1, DR	2.9	
PUNCH—Det. 26—2 x 2 units, ½ sq. inch x ½″ deep TS	1.2	
PUNCH—Det. 2—4 units, size 1, 2 required, DR	5.8	
	110.7	5.4

PUNCH PLATE:
OPENINGS FOR PUNCH

(Continued on Page 56)

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DIE WORK ESTIMATING SHEET

	A	B	C	D	E	F
Det. 16 DIE	.6 .8	.7	3.4 2.4	16.0 1.8		1.5
Det. 15 DIE	.5 .7	.7	2.4 1.4	8.0 .8		1.5
Det. 14 DIE	.5 .7	.5	.7 1.2	.6		1.5
Det. 13 DIE	.5 .7	.5	1.0	1.2		1.5
Det. 1 DIE	.5 .6	.5	1.7 2.7	1.2 8.0 .8		1.5
Det. 21 PUNCH	.6 .8			21.6		
Det. 12 PUNCH	.3 .4			2.0		
Det. 3 PUNCH PAD	.6 .4	.7				
Det. 25 STRIPPER	.4 .3	.7		7.4		2.0
Det. 20 STOP BLOCK	.5	.3				.5
Det. 23 STOCK REST		.3				
Det. 22 BACK GAGE		.7				
DIE SHOE				8.2		
(Screws and Dowels as per text)		2.7				
PUNCH HOLDER						4.0
(Screws and Dowels as per text)		.7				
Det. 11 FORM PAD			1.0 2.0	8.0 .8		
Det. 8 INSERT			.4 .9	5.0 .4		1.0
Det. 9 FORM PUNCH				8.0 .8		
Det. 19 PUNCH				5.8		
Det. 24 PUNCH				9.6		2.0
Det. 10 PAD				5.8		
Det. 7 PUNCH				2 9		1.0
Det. 26 FORM PUNCH				1.2		1.0
Det. 2 PUNCH				5.8		2.0
PUNCH PLATE				4.4		8.0
Det. 18 PERFORATOR					2.0	1.5
Det. 17 PILOT					3.0	
(Perforator and Pilot holes)					2.7	
Stock Spring					3.0	
Finger Stop					4.0	
Auto Stop					3.0	
Guide Bushings for Pilots					3.0	1 0
Det. 4 and 6 SPRING PINS					8.5	
DEVELOPMENT FOR TWO DOUBLE L-BENDS						5.0
TRYOUT						10.0
	10.4	9.0	21.2	136.1	29.2	50.5

Total 256.4 hours

Fig. 55

THEMAC Grinder Designed for Use on Bench Lathes

THE THEMAC Type J-15 Precision Grinder attaches to compound T-slot, is equipped with circumferential adjustment of the spindle assembly and the grinding wheel can be used right or left side, front or rear of motor—all exclusive features. The J-15 is designed for extreme accuracy, high speed operation of small wheels, plus power adaptability and vibrationless performance.

By attaching directly to the compound T-slot of the lathe, the total weight is directly above the point where the grinder is attached to the lathe, shaper, milling machine, etc. The grinding spindle motor unit, being circumferentially adjustable in clamp bracket, locks and operates in any position. This adjustment of the spindle assembly permits the height of the center of any lathe to be easily and quickly reached. The spindle assembly tube or housing is of an eccentric design, making it possible to adjust for the proper belt tension at all times.

The J-15 Grinder is supplied with four spindle assemblies—one for external grinding only, one for internal grinding, one for accommodating ⅛" mandrels, and one assembly for external and internal grinding.

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A copy of THEMAC Precision Grinders giving specifications, details of equipment and shipping instructions of Type J-15 and other THEMAC Grinders will be sent on request. Address The McGonegal Mfg. Co., Everett Pl. and Orchard St., E. Rutherford, N. J.

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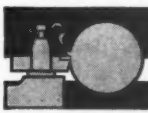

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A Faster, More Accurate Method for Cam Design and Cutting

By Charles R. Stowe

TREMENDOUS demands that are being made on technically trained men make it imperative that engineering methods—including designing procedure—be "stream-lined".

The design, development and manufacture of accurately operating cams are seldom simple jobs for designers, engineers or shopmen. The usual methods used for cam design have been long, intricate and cumbersome. There has been a great need for a system of simplifying cam designing and charting and for a method of increasing or assuring the accuracy of cams as they are cut.

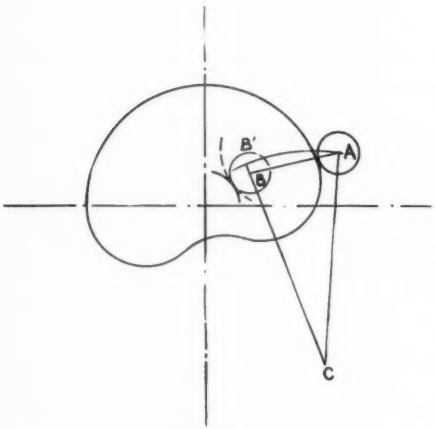


Fig. 1

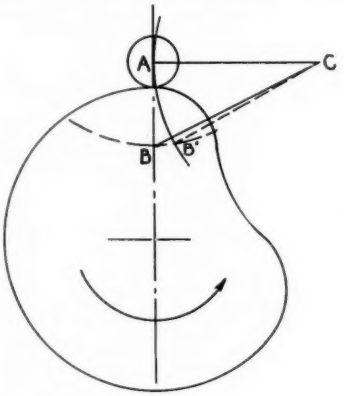


Fig. 2

Engineers have long been accustomed to the use of cam charts. Cam charts are made on the theory that the path of the cam arm motion is on the center line or at an angle which is constant. This theory holds true only when the follower arm rides in a slide and the motion is in and out. But since most follower arms are pivoted the travel is in an arc, and certain discrepancies occur which naturally upset the carefully calculated chart. This probably is the principal reason why tool rooms so often find it impossible to reproduce the exact precision movement conceived by the design engineer.

In the simple cam chart, Fig. 1, the discrepancy exists between B and B'. The contour as charted is accurate for the cam path A-B, however it is evident that the travel from A to B', the motion is long and slow and the travel from B' to A is short and fast. It is readily seen that, irrespective of the location of the point of discrepancy, the pivot C being fixed, the calculated contour is in error. It is clearly impractical, if not impossible, to compute the increments of the cam with the radius of the pivoted follower arm considered.

In the angle path, Fig. 2, it is ob-

(Continued on Page 32)

Hi-Speed Announces New Universal Hydraulic Valve

A NEW pilot operated, solenoid controlled hydraulic valve, the VA-100 SP Series, which because of its design is virtually a universal 4-way valve, is said to meet fully the requirements of a very wide range of applications which may be met by a remote control valve. An exclusive development of this valve permits a change from closed center to open center operation by the removal of an easily accessible pipe plug without changing to a special spool previously necessary.

The valve may be used as a spring centered three position valve. When so used both cylinder ports are blocked which hydraulically locks the cylinder being operated. It may also be used as a two position valve without springs; or a two position valve spring offset using one solenoid. The same pilot valves and solenoids are used for all sizes from 1½" down. Only small, inexpensive solenoids are required. All pilot ports are integral with the valve and no pilot piping is required.

All ports are designed to withstand full line pressure; valves may be used in tandem when desired. The valve can be furnished with a built-in relief valve which further simplifies piping.

The manufacturer lists the outstanding features of this valve as follows: its wide range of adaptability; the small size of the solenoids required to operate a large valve; compactness and accessibility; simplicity of piping required.

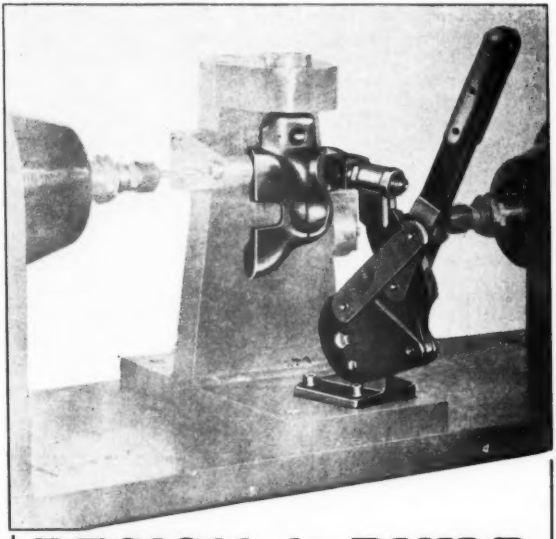
The new VA-100 SP Series valve requires no delicate adjustments.

It may be easily dismantled for cleaning and re-assembled in the field. The valve is made in the following sizes of pipe connections — 1½", 1¼", 1", ¾" and ½". Similar parts are made interchangeable as far as possible.

Helpful information will be sent on request. Send a print or sketch of your valve problem. Address Hydraulic Hi-Speed Company, 5438-A Tireman Ave., Detroit, Mich.

Jessop Steel Appoints Lewis

David S. Lewis has been appointed assistant to T. W. Pennington, sales manager, by Jessop Steel Company, Washington, Pa. Mr. Lewis joined the sales department of Jessop Steel Co. in 1928.



DESIGN & BUILD

KNU-VISE TOGGLE CLAMPS into those high production fixtures. Cam action enables work that varies in thickness to be held securely; toggle linkage releases clamping bar from work with more speed. Hinged base for flexibility of installation. Catalog on Request.

KNU-VISE INCORPORATED
16841 Hamilton Avenue
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When you order or write about products described in TDM PROGRESs please mention the publication.

Method for Cam Design and Cutting

(Continued from Page 30)

served that the same is true. In this case the computation is even more difficult. With the present heavy load on engineering departments and drawing rooms a method for reducing or eliminating detailed computations is particularly welcome.

Then, too, the relation of the follower arm to the cam is a factor to be considered. Otherwise, errors introduced may make the carefully charted and processed cam absolutely useless. Consider, for instance, the barrel or cylinder cam. This cam, to be accurate and efficient, has a tapered track. Often the track itself is responsible for the failure of the cam. The roller travels in a constant plane; while the angle of contact, in relation to the center line of the cam, is constantly changing.

To correct this constantly changing angle of contact and make the cam function as intended, persistent correction

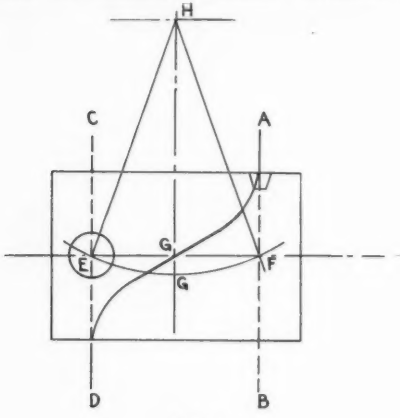

Fig. 3

is required. A second shop chart is made to correct these discrepancies step by step; and this second chart is the more difficult. Processing of what we presume to be a simple cylinder cam converting motion through a pivoted follower arm becomes prohibitive because of the complications in every step and the possibility or even probability of human error.

In Fig. 3 we show the error G-G' and the error in the path of the roller. In Fig. 4 we show the position of the roller in the track at G and also its position in the track at G'. It follows that the error in the angle of contact becomes greater as the roller approaches G' and diminishes as it leaves that point. Such a compensator automatically corrects the pitch of the track permitting the roller to seat properly, assuring a free, harmonic motion.

All types and sizes of cams have been processed with equal ease and accuracy —cams have been cut by this device complete in one working day or less— cams which took weeks to produce by the older methods. Master cams as well as experimental and production cams have been processed direct from the original print. To do this the detail of the follower arm relation to the cam and its radius must be shown.

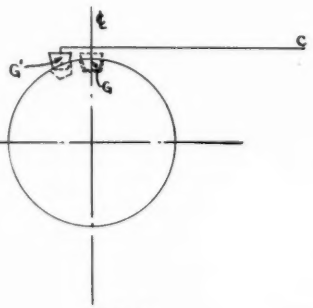

Fig. 4

The Schmidt Cam Compensator is designed to eliminate preliminary and experimental charting; its use guarantees precision cutting and permits master cam processing from the original chart.

Full information about more accurate processing of cams will be sent on request. Write R. J. Schmidt Co., 227 Colonial Arcade, Cleveland, O.

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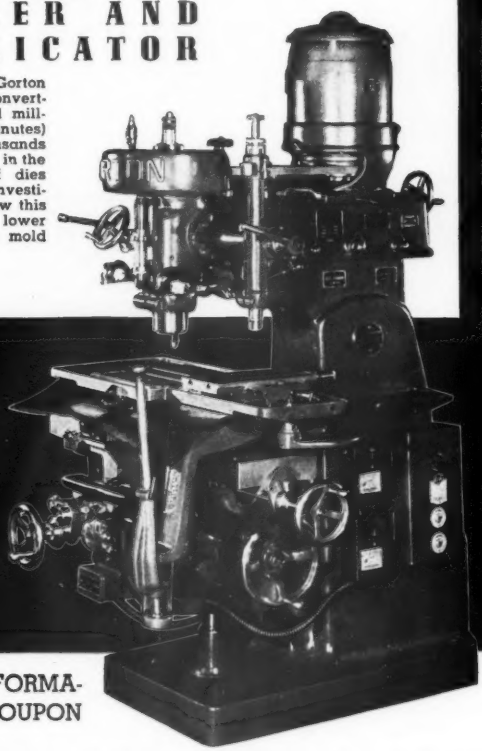
The use of Gorton Duplicators (converted into vertical millers in a few minutes) is saving thousands of dollars daily in the reproduction of dies and molds. Investigate and see how this machine can lower your die and mold costs.



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Please send me Bulletin No. 1319-B with complete information on GORTON Duplicators.

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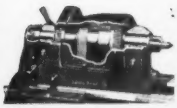
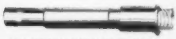


HEADSTOCK. Cutaway view showing integral type bearing and the capillary oiling system.



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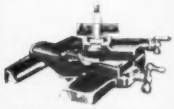
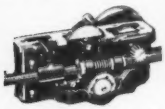
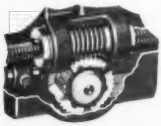


IMPROVED SADDLE and compound rest with adjustable tapered gibs. Cross slide bridge is wide and deep, providing rigid support for the tool rest.

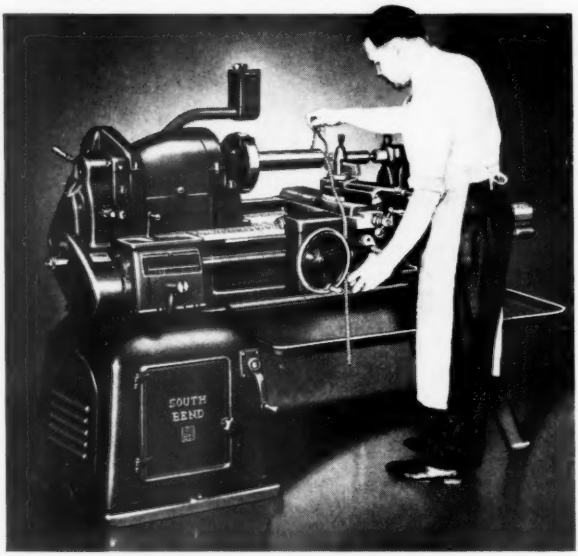


DOUBLE WALL APRON is rigid box type construction with all steel gears running in oil bath.



MULTIPLE DISC CLUTCH. Cutaway view shows alternate keyed steel disc construction.

UNDERNEATH MOTOR DRIVE. Belt drive to spindle is smooth and powerful and provides a wide range of spindle speeds.



PRECISION IS ASSURED in South Bend Lathes by combining fine workmanship with sound machine design. Expert mechanics fit each unit with an exactness known only to the machine tool builder.

South Bend Lathes are used in tool rooms of nationally known manufacturers for the most exacting classes of precision work. They are also used for production operations on interchangeable parts requiring a high degree of accuracy. Conveniently located controls assure an ease of operation which results in a uniformly efficient rate of production over a long period of time.

South Bend Lathes are manufactured in over 65 sizes and types. Popular sizes are available for delivery from dealer display stocks in important cities. Made in 9", 10", 13", 14½", and 16" swing, in 3' to 12' bed lengths, in Countershaft and Motor Drives.

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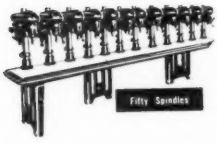

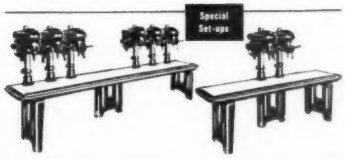

New, Exclusive Delta Machine gives you as many spindles as you need—spaced as you need them—at astonishingly low cost!

Designed and developed by Delta, pioneer producers of low-cost production drilling equipment, these new machines now give you just the number of spindles you need for any production set-up—two, three, six, eight, ten spindles or fifty—to suit your exact requirements.

Available with 14" or 17" heads—or any combination of both, with Jacob's chucks or No. 1 Morse-taper spindles in 14" heads; Jacob's chucks or No. 2 Morse-taper in 17" heads—high speed or low speed. Completely flexible and remarkably low in cost!

This new type of machine gives you an efficient, continuous production line, eliminating transferring between machines—and provides maximum working surface.

Ideal for special set-ups on long, heavy work, as sectional table can be made as long as necessary at slight extra cost.

For full details on this new "Tailor-made" drill press development—write us today, telling how many drill press heads you could use on a set-up like this, whether you need 17" or 14" heads or a combination of both, and how far apart you want the heads placed.

DELTA MFG. CO. (INDUSTRIAL DIVISION)
681 East Vienna Avenue, MILWAUKEE, WIS.

Delta Mfg. Co., 681 E. Vienna Ave., Milwaukee, Wis. Please send us without obligation full information on your new drill press development. We are interested in .... drill presses on this set-up, ... 17", ... 14", spaced ..... inches apart.
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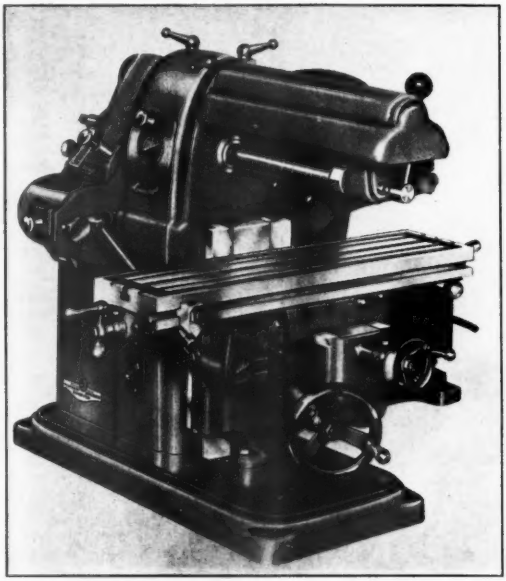
Atlas Announces New Precision Bench Milling Machine

THE new Atlas Precision Bench Milling Machine, the latest addition to the Atlas family of machine tools, is designed for improved efficiency, versatility and economy on small piece milling. Reflecting careful study, sound engineering and a thorough knowledge of both current tool room and production requirements, the new Atlas miller handles the full range of milling operations from heavy slabbing and facing to light end milling, keyways, finishing and layout work.



Three types of table controls are available: standard screw feed; rapid-production lever feed; and the new "Change-O-Matic" for instant selection of automatic table feeds. A wide range of spindle speeds provides correct surface speeds for all types of work and cutters. Swivel vise, rotary index table, indexing centers, safety belt guards and coolant system are available.

The new Atlas is ruggedly built, accurate and efficient—a machine tool designed to cut costs on all types of small milling jobs in the tool room and die shop. A complete description with specifications of the new miller, as well as the line of backgeared screw-cutting lathes, single and multiple spindle drill presses, a 7-inch shaper, mechanical and hydraulic arbor presses are included in the 1941 Atlas Catalog.

For a copy of 1941 Atlas Catalog, with full description of the new Atlas Precision Bench Milling Machine, write Atlas Press Company, 1112 N. Pitcher St., Kalamazoo, Mich.

Modern Collet Appoints Southwestern Representative

Floyd E. Doty, head of the Engineering Sales Company, 112 Portwood St., Houston, Texas, has been appointed by the Modern Collet and Machine Company of Ecorse, Michigan, to represent them in the Southwest. The sales territory includes Texas, New Mexico, Oklahoma and Colorado.

Tool·Die·Machine PROGRESS is the fastest growing paper in the metal working field.

McKenna Doubles Capacity to Keep Up with Sales

TO keep pace with current demand for hard carbide tools and blanks, which has been greatly accelerated by the National Defense program, McKenna Metals Co., Latrobe, Pa., has more than doubled its production capacity within the last few months, according to Mr. Philip M. McKenna.

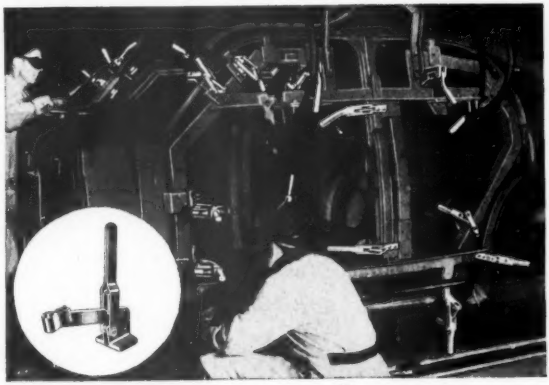
This large increase in production has been made possible by a plant expansion program, which has included the erection of three new buildings by Blaw-Knox Co., the purchase of a new vacuum furnace for the manufacture of carbides, and the installation of grinders, machine tools, and other equipment for making carbide-tipped tools. As a result of these enlarged production facilities, the company has been able to maintain prompt deliveries of tools and blanks to arsenals, armories, airplane engine manufacturers, and other plants machining metal parts both for armaments and for commercial products.

Motor Tool Improves Live Ball and Roller Bearing Center

THE economical Live Ball and Roller Bearing Center for lathes, hand screw machines, hand mills and grinders, first placed on the market 18 months ago by Motor Tool Manufacturing Co., has been greatly improved, according to the manufacturer. The center is constructed with a short length head of small diameter and has a large diameter spindle. A very slight overhang, a very desirable feature, is made possible by the short length of head. Simple and sturdy, the improved center has 50% more radial load carrying capacity than the average live center.

A roller bearing in the front end of the head carries the radial load, a three - point bearing contact with balls carries the thrust load. A needle bearing in the end of the taper shank is provided for alignment, to assure free running. The spindle can be locked with a cap screw to re-dress point in your machine. A compression pad to compensate for heating and expansion of metal is provided. A special oil seal protects bearings.

For complete details and prices on the improved Live Ball and Roller Bearing Center, write Motor Tool Mfg. Co., 12283 Turner Ave., Detroit, Mich.



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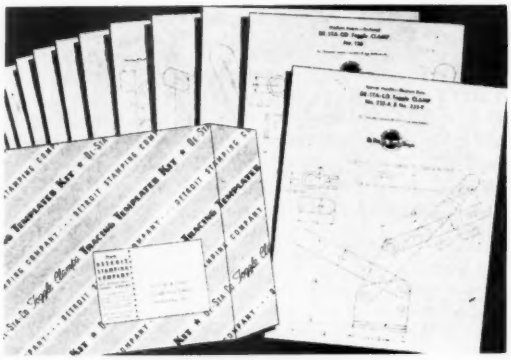
New Toggle-Clamp Templates Kit a Boon to Tool Designers



SHOP men who design and lay out work know the time and energy that is consumed in properly selecting, figuring and detailing toggle clamps which are to hold parts in production fixtures. Mr. G. H. Roberts, president of the Detroit Stamping Company, has evolved a new idea which eliminates this tedious, costly process and helps materially in speeding up preparations for production. The idea is the De-Sta-Co Toggle-Clamp Templates Kit, prepared at a considerable cost, in which templates are drawn to actual dimensions and scaled precisely to De-Sta-Co *new* measurements—enabling the designer to instantly select the proper toggle clamp for each application. The proper template is laid on the board, under the drawing paper, and the toggle clamp, in correct position and exact size, can be easily traced in a few minutes *without prefiguring or tedious detail.*

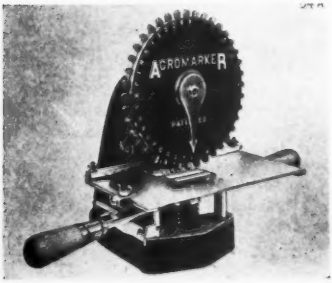
The De-Sta-Co Toggle-Clamp Templates Kit contains eighteen different templates, ranging from light up to air-operated heavy duty models. Enveloped in strong lasting fiber, the templates are reproduced on hard finish parchment paper—each template is easy to find, quick and sure in use. The kit should give years of lasting service.

The De-Sta-Co Kit will be sent on request, without charge, so long as a limited supply lasts, to any accredited Tool Designer; and of course to other executives who have occasion to use toggle clamp templates. To be accredited, it is necessary only that you should be actually employed as a tool designer or do related work, and that your request come on your company or employer's letterhead, with a notation as to your position.

The De-Sta-Co Kit cannot be bought in stores. You should find in the De-Sta-Co Kit some tracing templates that you can use—often—to your and your company's advantage.

For your copy of the De-Sta-Co Toggle-Clamp Templates Kit, address your request to Detroit Stamping Company, 344 Midland Ave., Detroit, Michigan.

Bates Announces New Name Plate Marking Machine



THE new AcromarkeR Name Plate Stamping Machine, more efficient than ever for stamping complete name plates from metal strip and for filling in serial numbers, specifications and other information into etched, embossed, cast and other types of metal, fibre and plastic name plates is announced by H. O. Bates, The AcromarK Co.

This new machine is attractively designed and utilizes tested and proven principles to gain its improved efficiency.

(Continued on next Page)

New Bates Marking Machine

(Continued from Page 38)

For example, it is precision built, permitting all parts to work accurately and in perfect unison, insuring the utmost ease of operation and marking accuracy.

The die wheel carries a full alphabet and a full set of figures, also dash, diagonal line, comma and period. Special trade marks or inspectors' symbols can be used as desired. Each die is machine engraved and hand finished for maximum accuracy, tempered and tested. The holding fixture receives a name plate up to 8" by 4¾" and permits stamping within an area of 5" left to right by 3¼" top to bottom by .000 to ⅝" thick.

The die wheel rotates on a double row SKF precision roller bearing, turning freely and having a positive stop positioning for each character. This is of particular advantage where varied spacing or the spacing of a narrow letter such as "I" is necessary. The powerful screw pressure principle permits the stamping of steel, stainless steel and alloy steels and the dies are of sufficient quality to withstand such service.

The black wrinkle finish gives the machine a very attractive appearance and the dull chromium plated table eliminates glare. Several sizes of these new machines will be carried in stock and special sizes can be promptly made to order.

Complete information and prices on the new AcromarK Name Plate Stamping Machine will be sent promptly on request. Address H. O. Bates, The AcromarK Co., 261 N. Broad St., Elizabeth, N. J.

"Giving Wings to Man"

The November-December issue of "Stampings," the house organ of Detroit Stamping Co., carries a very interesting short article on the development of the aircraft industry in the United States and illustrates a number of the pressed metal parts produced by this company for aircraft. The Detroit Stamping Co. produces small and medium size stampings up to 46" in length or 3" draw or ⅜" stock thickness as well as dies for such stampings, the De-Sta-Co Toggle Clamps and Pliers, arbor spacers and special washers. For a copy of "Stampings", write the Company at 344 Midland Ave., Detroit, Michigan.

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PRECISION TOOLS
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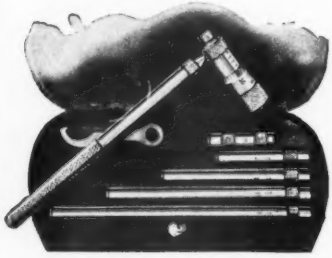
These tools have been especially selected for accuracy, precision workmanship and value. All are necessities in a good mechanic's tool box.

Reed Two Inch Micrometers with 1/10000" Vernier.

Accurate—*Reasonable in Price.*

The MECHANIC'S OWN Ultra-Chex set. Accurate to 8 millionths. Five blocks 1"—.500"—.250"—.125"—.0625". Essential for toolmakers. Price $12.50 complete in case. *Order now.*



Reed Inside Micrometer. Accuracy guaranteed. Measures from 1½" to 12". *Write for folder showing 30 other types of Reed Micrometers.*

GEO. SCHERR CO. INCORPORATED 128-B Lafayette St. New York, N. Y.

Marshall on Drill Jigs

(Continued from Page 24)

limits. The hole must be central between the sides and one inch from the end. The diameter of the hole also must be accurate.

The base A is made of cold rolled steel. The bottom is relieved so as to rest on the corners only. The top is surface ground to be perfectly flat. The two side plates B are made of tool steel and hardened and ground. The thickness is more than the work to be drilled to allow the clamp C to swing over it easily. The length is sufficient for the end clamps to clear the work. These are assembled on the base exactly parallel to each other and exactly 2.000 inches apart. They are screwed and doweled to the base. The stop for the end D is fitted in slots in the side pieces. The working face is ground after hardening to be at right angle to the working surfaces of the side pieces.

The top plate E is made of cold rolled steel. The bushing F is a standard commercial bushing.

In the assembly the side plates are screwed and doweled to the base first. Then the end plate is assembled and ground. The top plate is bored and the bushing pressed in. Then three small blocks are ground to a size equal to the distance from a plug in the bushing to the sides and ends of the jig. The plug is placed in the bushing and then the blocks, placed one on each side and on the end, and the screw and dowel holes are transferred from the sides. Then the clamps and set screws are made and assembled and the jig is done.

New Plant for Sheffield Gage

The Sheffield Gage Corporation reports that they have begun the construction of a new air conditioned gage manufacturing plant under a five year Government Defense Facilities Contract.

The new plant will provide an additional floor space of approximately 32,000 square feet, which slightly more than doubles the present capacity.

The new plant, one of four such plants recently authorized by the War Department, will cost approximately one million dollars. It is expected to be ready for operation in about six months.

When you order or write about products described in TDM PROGRESS please mention the publication.

Foster Introduces Electric Sizing Gauge For Close Tolerance Grinding Work

THE Foster Electric Sizing Gauge was developed for use on grinding machines where the tolerances allowable were exceedingly small. The gauge, which is for use on grinders where there is an automatic or hydraulic infeed up to a predetermined infeed of the wheel, incorporates two electric switches—one switch controls the stoppage of the infeed of the wheel and allows sufficient sparkout to bring the work to a finished size. When the work is at finished size, the second switch, through its controls, operates to retract the wheel from the work. All the moving parts in the gauge are either of hardened steel or tungsten carbide to assure long wear and extreme accuracy. They run dry at all times, therefore eliminating the possibility of any oil film that may influence the accuracy of the gauge. The electric contacts in closing approach each other instantaneously. They are held well open until the gauge plunger operates the switch mechanism.

The lower end of the gauge at the caliper frame where it surrounds the work is equipped with tungsten gauge points for the reduction of wear. The normal wear in these gauge points and throughout the mechanism of the electric switch gauge is compensated for by two micrometer adjustments. The one at the top of the gauge has graduations of .001. The micrometer adjustments on the face of the gauge are amplified so that each graduation provides an adjustment of .0001 graduation. If the operator is grinding work and wishes to increase his size either by one or more tenths, he releases the locking screw on the under side of the gauge and turns his micrometer adjustment whichever way is required for setting the gauge to make the electric contact for a larger or smaller diameter.

The entire gauge is ruggedly built

(Continued on Page 47)

ALLEN accuracy
holds your work
true to close-tolerance limits

Diemakers find in Allen Hollow Screws the qualities indispensable to accurate locating of work and retention of assemblies.

The Socket Head Cap Screws and Shoulder Screws (Stripper Bolts) are *"pressur-formd"* to preserve *continuous* steel-fibres shaped to the contour of the screw head, increasing strength for tight set-ups. The Allen *"duo-process"* threading makes the axial fibres of the steel conform to the contours of the thread profile, — structurally reinforces thread-accuracy that evenly distributes friction-pressure over the entire length of the thread.

The Dowel Pins (like the Hollow Screws) are made of special *Allenoy* steel, ground to exceedingly close tolerance limits, with tensile strength of 240,000 to 250,000 lbs. per square inch.

Ask for descriptive folder G-21

THE ALLEN MANUFACTURING COMPANY
Hartford, Connecticut, U. S. A.

TRU-GROUND SHOULDER

SCREWS • DOWEL PINS

When you order or write about products described in TDM PROGRESS please mention the publication.

the
FOSTER
Precision Electric Sizing Gauge

This gauge has been developed to meet a specific need — its construction has been dictated by eighteen years experience in the manufacture and sale of grinding gauges of all types.

The electric sizing gauge is readily adjustable to meet the varying conditions as found on the older type and the more modern type of external cylindrical grinders.

Adjustments are provided for variations in size by .001" or .0001" by graduations of a micrometer screw. The calipering or lower end of the gauge is adjustable throughout each caliper frame size of 1" range. Caliper frames have been made up to 16".
Our engineering facilities are available to anyone desiring to gauge ground work while in process by either a mechanical visual or electric control. Through our hundred or more special designs we can find something to meet your particular problem.
We will be glad to receive your inquiries and will send you our printed matter and any special information requested.

FOSTER
ENGINEERING COMPANY
22748 Woodward Avenue
Ferndale Michigan

Mold-Sinking

(Continued from Page 17)

raised in the bottom of a tool steel cavity by means of a hob, but it cannot be very high and it may require more than one hob to accomplish the job. A hob may be broken very easily, even in soft metal, if it is pushed too fast or with too much load.

Milling

Milling is a universal method of mold sinking and it is used more than any of the other special methods. Almost any cavity can be milled if necessary, although accurate milling is confined to the combinations of motions which can be obtained on the three lead screws and an angular head. Irregular curves can be milled from a layout. Turning should be included in this machining classification.

In case only one cavity is to be made, milling is usually the most economical method although exceptions occur as are pointed out under hobbing and duplicating. When it is necessary because of the heavy pressures of certain materials to use tool steel for the cavity, it has to be milled, rather than hobbed. Conversely, when parts are going to be milled, such as the forces, they should be made of the best steel available for better service and finish. Carburizing steels do not have as much resistance to crushing as the alloy steels.

(to be continued)

Ohio Gear Announces New Small Speed Reducer

After more than a year of field tests the Ohio Gear Company announces that their new BHU Speed Reducer is ready for tool room and die shop use. Its dimensions, 5⅜" by 3", with a height of 5⅝" make it specially adaptable for use with fractional HP motors.

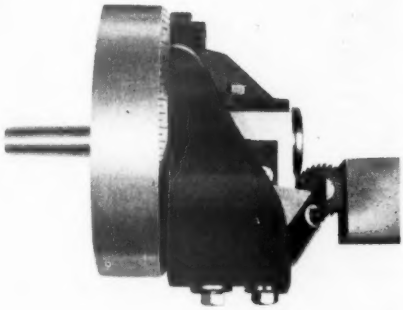
The BHU is offered in three assemblies with output shaft projecting to right, to left or to both right and left. Six stock ratios are available between 10:1 and 48:1. A bronze worm wheel and a hardened ground worm operate in Timken roller bearings. Torque capacity is 150 inch pounds.

Literature on the Ohio BHU Speed Reducer is ready for distribution. Write Ohio Gear Company, 1339 E. 179th Street, Cleveland, O.

When you order or write about products described in TDM PROGRESS please mention the publication.

Aber Cherrying Attachment Speeds Forming, Die Casting and Drop Forging Dies

A NEW product, the Aber Cherrying Attachment, designed to fit any horizontal and 90 per cent of vertical milling machines, cuts a true half circle with a curved tooth cutter which ROTATES, giving a long, continuous shearing cut. The builder, Aber Engineering Works, Racine, Wis., states that the Cherrying Attachment can be used for finishing cuts, squaring out corners, and making special shapes in forging dies, die casting dies, forming dies and for molds where the cuts must be smooth and have a fine finish. It is asserted that the Aber Attachment positively does not chatter, nor does it leave small radii that have to be taken out by hand. Hand labor in making forging dies is eliminated, a very considerable advantage.



The Aber Cherrying Attachment fits any horizontal milling machine, the casting designed for the attachment fitting onto the column with four bolts. The Attachment also can be used with some die sinking machines. On other die sinkers it can be attached if a special casting to hold it is made. Clear vision at all times from all angles while cutting channels, odd shapes to a variety of

(Continued on Page 47)

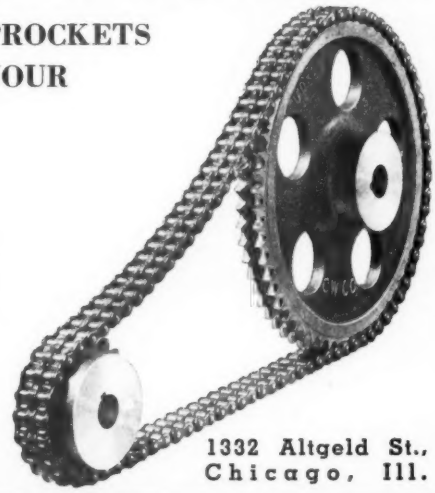
CULLMAN SPROCKETS

Over 45,000 SPROCKETS IN STOCK FOR YOUR IMMEDIATE NEEDS

We also have in stock Diamond Chains for all Roller and Block Sprockets.

Send for Catalog

Cullman Wheel Co.



1332 Altgeld St., Chicago, Ill.

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Recent Industry Publications

JESSOP TOOL STEEL RECOMMENDATIONS—a 22" x 28" wall chart lists the Jessop tool steels recommended for over 150 applications including a wide variety of dies, punches, cutters, reamers, gages, saws, taps and other tool room and die shop products. The recommendations are keyed for both ordinary runs and for the longest runs anticipated. The bottom section of the chart is a tabular set of recommendations for heat treatment for different brands of Jessop steel. A copy of the Tool Steel Recommendations chart will be sent tool rooms and die shops on request. Write Jessop Steel Company, 500 Green St., Washington, Pa.

CATALOG NO. 16-T, illustrating and describing the new 16" Series "S" South Bend Precision Lathe, has just been published by the South Bend Lathe Works. The catalog features the new 16" Series "S" Lathes, which are made in three types: Toolroom, Quick Change Gear and Standard Change Gear. The Toolroom Lathes are made in 6', 7' and 8' lengths—other models are made in 6', 7', 8', 10' and 12' bed lengths. Attachments for toolroom production and maintenance work are described and features of construction are outlined in detail. For your copy address South Bend Lathe Works, 197 E. Madison St., South Bend, Ind.

"HOLDEN HIGH SPEED HARDENING BATHS," a bulletin of the A. F. Holden Company, describes the high speed bath developed by this company for use with any of the molybdenum high speed steels and any of the standard tungsten steels, 18-4-1, 18-4-2 and 18-4-3. The method includes the use of the ceramic pot in reducing the consumption of Holden high speed bath. A copy of this bulletin will be sent on request from the A. F. Holden Company, New Haven, Conn.

STANDARD AND SPECIAL CUTTING TOOLS—Catalog No. 40 of the Gairing Tool Company, a 96-page wire-binding booklet, lists the Standard Cutting Tools, Gair-Lock Tools and Special Tools in three general sections. Prominent in the Gairing line are the three types, "A", "B", and "C" counterbores and countersinks, back spotfacers, adjustable hollow mills, the Gair-Lock Milling Cutters (shell, side, face and alternate tooth), cemented carbide tools, floating and anti-friction holders. The designing and engineering service offered by this company is detailed. A good index adds value to the catalog for quick reference. A copy of Catalog No. 40 will be sent on request. Address Gairing Tool Company, 1631 Lafayette Blvd., Detroit, Mich.

DRAFTO PORTABLE DRAWING MACHINES—a new circular illustrates and details the advantages of the Drafto Portable Drawing Machines—built in four sizes to be used for practically all engineering drawings. Detachable scales, protractor graduated to 2° and clamping device that produces equal locking tension at all angles are some of the advantages. A larger Drafto, provided with a special bracket for mounting on a 23" x 31" board, is also described. Write The Drafto Company, Cochranton, Pa. Ask for Circular P.

INDUSTRIAL FLEXIBLE SHAFT MACHINES by Walker-Turner Co., Inc., are now available with the new Shockproof Two Speed Geared Motors—giving a choice of two speeds at the pressure of a button. Write for new bulletin SFP giving specifications of this well-known line of flexible shaft machines. Address Walker-Turner Co., Inc., Plainfield, N. J.

THE FRAY NO. 7 "ALL ANGLE" MILLING MACHINE, a 100 percent fully universal milling machine for toolmakers, is described in detail, with outstanding features given in a new 8-page booklet. An exclusive feature, especially appreciated by toolmakers, is the 10 inches of cross travel above the turret head, permitting angular machining operations without changing the set-up of the work. Fray "All Angle" Milling Attachments and other accessories are also listed. A copy of the new booklet P will be sent on request. Address Fray Machine Tool Co., 517 W. Windsor Road, Glendale, Cal.

PRECISION-THIN LAMINATED SHIM STOCK, packaged in 100-inch lengths in a slotted carton, is now furnished with half inch markings on one edge. The markings make for both speed and economy in the use of the stock and, as the inch marks are progressive, they act as a continuous inventory, preventing replacement delays. Either brass or steel shim stock (6" wide, thicknesses from .001 to .015) is available in the slotted cartons. For literature write Laminated Shim Co., Inc., Glenbrook, Conn.

MODEL H PYRO-UNIVERSAL HARDNESS TESTER, a direct reading instrument giving hardness numbers in three standard scales without conversion or reference to charts is described and illustrated in a circular released by Pyro-Electro Instrument Co. A standard tool room instrument for Rockwelling or Brinelling. Model H is sold completely equipped ready for use. Ask for Circular H. Pyro-Electro Instrument Co., 10381 Chicago Blvd., Detroit, Mich.

MERCURY A 1001 LIFT TRUCK, the newest addition to the Mercury line of shop trucks, is equipped with a power winch, conveniently disposed cable sheaves and accurate hydraulic control of platform movement. Truck capacities up to 10,000 lbs. Write for details to Mercury Manufacturing Co., 4129 S. Halsted St., Chicago, Ill.

THE VERNON 11" SHAPER—variable speed drive, universal table, swivel vise with steel jaws, special alloy rocker arm and other features of this modern, precision low-cost machine tool are described in new illustrated circular, which will be sent on request. Address Machinery Manufacturing Co., Dept. 40, P.O. Box 155, Vernon Br., Los Angeles, Cal.

THE LINCOLN WELDIRECTORY—a detailed procedure bulletin covers all types of welding, giving complete working instructions. Flat, vertical or overhead welding of mild steel, flat welding of deep groove joints in high tensile steels, welding light gage, stainless, the common alloy steels, non-ferrous metals and of

(Please turn to Page 46)

Toolmakers Successfully Braze Own Tools with KENNAMETAL Tips

By Alexander C. McKenna, Chief Engineer, McKenna Metals Co.

THE advantages inherent in hard carbide tool materials, through their ability to machine at higher speeds with less "down time" for regrinding tools, are now being utilized in special tools designed in the customer's own plant, as well as in standard tools supplied by the carbide manufacturers.

An example of such special tools now being tipped with hard carbides is illustrated in Fig. 1. This tool is one of three used simultaneously for spot facing eyes in front of yoke forgings made of S.A.E. 3140, as shown in Fig. 2. All three tools had recesses milled away along the cutting edge into which ⅛" x ⅜" x 1½" blanks of Kennametal grade KM were brazed. The blanks were supplied by McKenna Metals Co., who have developed this strong, crater-resisting hard

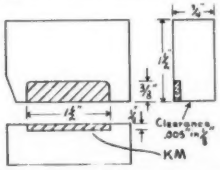


Fig. 1

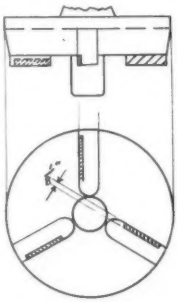
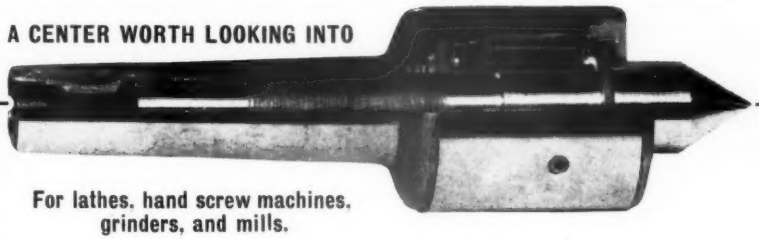


Fig. 2

(Continued on Page 48)

A CENTER WORTH LOOKING INTO



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The features that interest you most:

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4. With aid of cap screw you can lock spindle to redress point right in your machine.
5. Special oil seal to retain lubricant and keep out foreign matter.
6. A compression pad to compensate for heating and expansion of metal as a safety factor, with reasonable diligence exercised.

Try our ten-day trial plan. If not perfectly satisfied, your money will be cheerfully refunded.

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MOTOR TOOL MFG. CO. 12283 TURNER AVE. DETROIT, MICHIGAN

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Recent Industry Publications

(Continued from Page 44)

particular interest to tool and die makers, the Weldirectory gives followable instructions for making tool steel cutting edges on ordinary steel and for rebuilding worn dies and tools. "Toolweld 60" electrode used for providing high speed steel cutting or working edges and for making up metal-cutting and forming tools and "Toolweld 55" electrode for making up or repairing tool steel parts, subject to considerable shock or impact, are described. A chart for the selection of correct electrodes for each application is a feature. Please ask for your copy on your department or company letterhead. Write The Lincoln Electric Co., 12817 Coit Road, Cleveland, O.

THE MAXI-JR.-E. SUPER SENSITIVE DRILLING MACHINE, known and used all over the world for a generation, sets the standard for drilling small holes .004" to .250" diameter. Makes precision work easier and faster—sturdy enough for economical production work. Literature on request. Write A. Muehlmatt Div., The Hamilton Tool Co., 222 North B St., Hamilton, O.

GORTON SUPER-SPEED VERTICAL MILLING MACHINES—Catalog 1400 A illustrates, describes and gives full specifications and accessories for the three Super-Speed Vertical Machines in the Gorton line. The eight exclusive advantages are illustrated in detail. These machines, particularly designed for tool room work, have greater operating convenience, more accurate settings with large micrometer dials, the highest spindle-speeds (6300 rpm with standard equipment and 12,000 rpm with special equipment) and what is very important to crowded shops, occupy a minimum floor space. A copy of Catalog 1400 A will be sent on request. Write George Gorton Machine Co., 1119 13th St., Racine, Wis.

NEW HASKINS TYPE C TAPPER, air controlled for precision, unvarying performance—**cushioned** pressure—quick setting for any job—sensitive-safety tap head action. Complete details in new free booklet. Write R. G. Haskins Co., 613 S. California Ave., Chicago, Ill.

NEW MILLER 50 FOOT CANDLER—the first 50 foot candle RML continuous fluorescent lighting unit — modern—efficient—economical—flexible. For your new addition or an improved lighting system in your present shop. Write for new booklet "50 Foot Candler" to The Miller Company, Meriden, Conn.

CARPENTER'S MATCHED TOOL STEEL MANUAL—This 63-page book describes the Carpenter Matched Set Method of Tool Steel Selection. Tables, diagrams, illustrations and text. Please use your company letterhead when you write The Carpenter Steel Company, 160 Bern St., Reading, Pa.

VACUUM CUPS FOR MOTOR DRIVES—the new low priced "Production Line" with full specifications and prices are shown in brief in literature now ready for distribution. Ten advantages of the patented vacuum cup pulleys are given. All standard pulleys are carried in stock and subject to 30-day free trial offer. Write Vacuum Cup Metal Pulley Co., Inc., 12536 Grand River Ave., Detroit, Mich. Ask for Bulletin VCP.

WALTON TAP EXTRACTORS back out broken taps quickly, without annealing, drilling or the use of special tools. Folder 132 gives sizes, styles and costs of individual and sets of tap extractors. For a copy of this folder write The Walton Co., 88 Allyn St., Hartford, Conn.

SEVERANCE MIDGET MILLING CUTTERS—Special Tools Catalog No. 12 lists the standard cutters, "Chatterless" Countersinks, seating, facing, tube, burring and other cutters—all made of high speed steel, ground from the solid after hardening. Special sizes and shapes of cutters are made to order—the catalog gives full instructions for ordering special cutters. The Severance regrinding service is also described. For a copy of Catalog No. 12 write Severance Tool Manufacturing Co., 1506 E. Genesee Ave., Saginaw, Mich.

LOWER LAPPING COSTS with Boyar-Schultz copperhead laps—the laps with patented replaceable copper sleeves. The bulletin lists complete stock of all sizes from ⅛" to 2½". Write for your copy to Boyar-Schultz Corporation, 2112 Walnut St., Chicago, Ill.

CRUCIBLE ALLOY AND MACHINING STEELS, new Central States Edition of Data and Stock List, is now ready for distribution. Detailed information including specifications, heat treating recommendations and mechanical property chart is included for each S.A.E. alloy. A new chart of analysis of Army and Navy Specifications with equivalent S.A.E. grades is a feature. The four grades of Max-El machinery steel, with suggested applications, are also listed. A copy of Alloy and Machinery Steels, Central States Edition, will be sent on your request. Ask your Crucible representative or write Crucible Steel Company of America, 405 Lexington Ave., New York, N. Y.

THE MILWAUKEE MIDGETMILL, specially designed to get the most from end mills and milling machines, mills, drills and bores with the utmost rigidity. Applications of the Midgetmill to work on dies, fixtures, templates and other tool room jobs are illustrated and the exclusive features of Midgetmill are described in Bulletin No. 662-A, copy of which will be sent on request. Address Kearney & Trecker Corporation, Milwaukee, Wis.

THE CONSTRUCTION OF ELECTRIC FURNACES FOR THE LABORATORY, a 22-page engineering bulletin, describes the standard types of laboratory furnaces and discusses the proper selection of refractory tubes, cores, muffles and cements used. Detailed methods and design data are presented. The proper power input for a selected temperature is plotted on sets of curves in three charts for standard Alundum core pot, Alundum tube and outside wound muffle furnace. A copy of this bulletin will be mailed on request. Write Norton Company, Worcester, Mass.

Foster Electric Sizing Gauge

(Continued from Page 41)

and vibration from the machine does not affect it. It is mounted on a fork rod from the wheelguard with suitable elevating mechanism to keep the gauge in contact with the work and also to support the gauge above the work when the operator is removing the finished piece to replace with an unground or rough ground part. The gauge has been in thorough test for a period of three months and maintained tolerances far closer than has ever been possible to hold by operator manual control.

For further information on the new Electric Sizing Gauge, write Foster Engineering Company, 22748 Woodward Ave., Ferndale, Mich.

Aber Cherrying Attachment

(Continued from Page 43)

depths and diameters is an outstanding feature of the Aber Attachment. The most difficult cuts can be made with an amazing economy of man and machine hours.

Work on all diameters can be cut with an ordinary inexpensive cutter on a vertical end mill. Then the Aber Cherrying Cutter is used for absolute accuracy in the final ⅛" of the cut. This completely finishes the cut and for most jobs requires no chipping, grinding, filing or any hand finishing operations. The spindle fits a standard mill spindle. Two bolts loosen cutter driving gear housing to accommodate different diameter cutters. The mill casting has a 360° polished individually calibrated scale to determine work angles.

The cherrying attachment described comes in two sizes: The Standard having a cutter range from 1⅛" to 3½" in diameter; the Special having a cutter range from 1⅛" to 6¾" in diameter.

The Aber Cherrying Attachment, in spite of its many advantages, is sold at a price that every tool and die shop can afford.

Literature on the new Aber Cherrying Attachment will be sent on request. Write Aber Engineering Works, 1613 Flett Ave., Racine, Wis.

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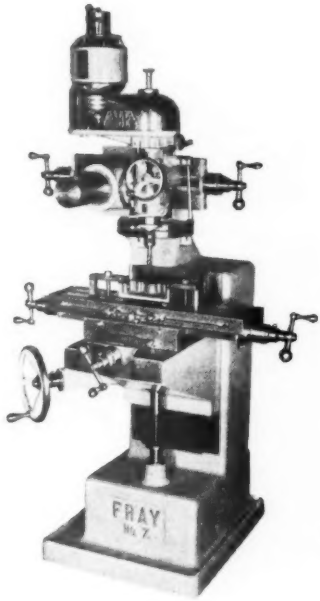

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A furnace that matches its name. In the tool room or in production this furnace does the job accurately and fast. No lost time waiting for temperature changes or checking temperatures. The Despatch furnace will maintain any point from 275° to 1250° F. — no overshoot or creeping.

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Bulletin No. 83 will give interesting details of how Despatch furnace can combine many features to make an all around utility furnace satisfactory.

WRITE FOR BULLETIN 83

DESPATCH
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Toolmakers Braze Own Tools

(Continued from Page 45)

carbide especially for cutting steel.

The tools were operated at 115 R.P.M. as compared to 75 R.P.M. for the high speed steel tools formerly used. These higher speeds are customary—even desirable—when replacing high speed tools with carbide tools. In this case, the actual cutting speed varied from 120 ft. per min. (at point farthest from center of forging) to 50 ft. per min. (at point nearest the center). The increase in cutting speeds not only reduces machining time per piece but also produces a smoother finish. On this job, a smooth finish free of "tears" was found even towards the center of the forging where the lower speed prevailed.

The Kennametal tips used on these tools had a hardness of 76.6 Rockwell C, and production figures revealed an average of 350 pieces per grind for the Kennametal-tipped tools, as compared to 75 pieces per grind for the high speed steel tools formerly used. This not only reduced "down time" for regrinding tools but also resulted in longer tool life.

While it is comparatively easy to tip metal cutting tools with hard carbide blanks (involving, in most cases, simple milling and brazing operations), it is frequently desirable to change the tool angles so as to utilize the physical properties inherent in carbide materials to full advantage. For this reason, tool designers contemplating the use of hard carbide tips on non-standard tools should consult the carbide manufacturer before actually designing the tool.

PUBLISHER'S NOTE — A 16-page price list (Price List No. 5), containing new low prices on twenty standard Kennametal-tipped tools, five styles of Kennametal blanks, nine semi-standard tools, two milling cutters, and three lathe and grinder centers, has just been issued by McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa. The new Price List also contains prices for blank weights from 1 to 1,000 grams of Kennametal. Drawings illustrating twenty standard Kennametal tools are shown on the front cover, on which tool savings up to 60% are made possible by the new low prices. Copies will be sent free upon request.

15,000 copies this issue distributed.

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● This directory of products lists for ready reference the names of manufacturers and dealers whose sales to Tool·Die·Machine PROGRESS readers have established them as dependable in every sense of the word. They merit your consideration.

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Allen Mfg. Co., Hartford, Conn.
Holo-Krome Screw Corp., Hartford, Conn.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

BORING HEADS—Offset
Precision Tool Co., The, P. O. Box 155, Brooklyn, N. Y.

BROACHING PRESSES—Standard and Utility
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BUSHINGS—Die
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

CALIPERS
L. S. Starrett Co., Athol, Mass.
Lufkin Rule Co., Saginaw, Mich.

CAMS
George Gorton Machine Co., 1119—13th St., Racine, Wisconsin.

CAM DEVELOPMENT
R. J. Schmidt Co., 227 Colonial Arcade, Cleveland, O.

CAP SCREWS—Flat Head
Allen Mfg. Co., Hartford, Conn.

CAP SCREWS—Socket Head
Allen Mfg. Co., Hartford, Conn.

CARBIDE TOOLS AND BLANKS
Gairing Tool Co., The, 1631 Lafayette Blvd., Detroit, Mich.
McKenna Metals Company, 500 Lloyd Ave., Latrobe, Pa.
Motor Tool Mfg. Co., 12283 Turner Ave., Detroit, Mich.

CASTINGS—Air and Oil Hardening Tool Steel Cast to Shape
Forging and Casting Corp., The, Ferndale (Detroit), Mich.

CASTINGS—Nitri-Cast-Iron
Forging and Casting Corp., The, Ferndale (Detroit), Mich.

CHUCKS—Collet
The Tomkins-Johnson Co., 630 North Mechanic St., Jackson, Mich.
George Gorton Machine Co., 1119—13th St., Racine, Wisconsin.

CLAMPS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

CLAMPS—Toggle
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

CLAMPS—Toolmakers
L. S. Starrett Co., Athol, Mass.

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Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

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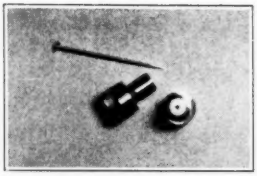

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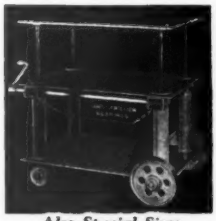

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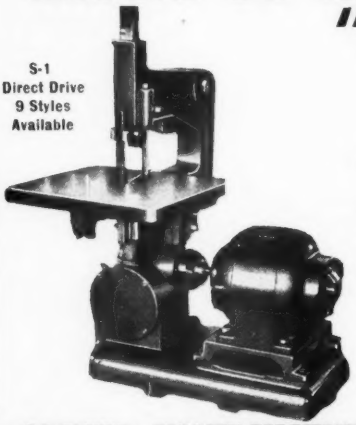

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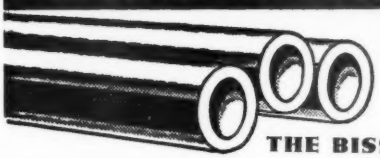

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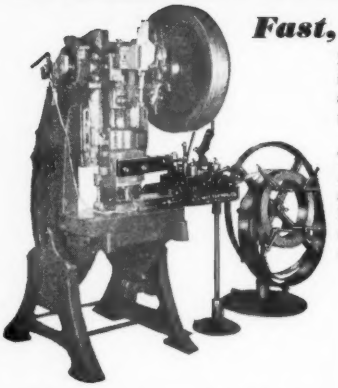

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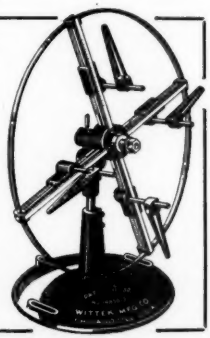

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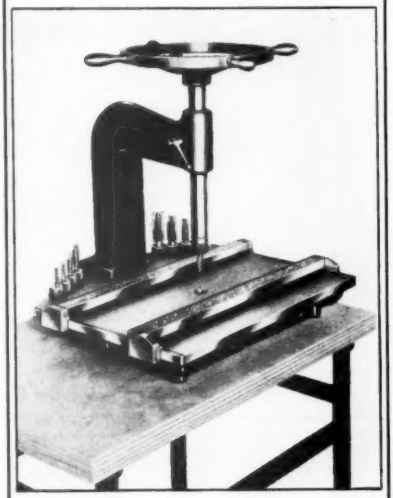

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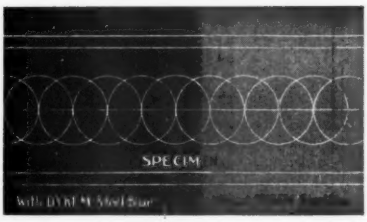
Write for Folder 132

Each Tool Must Sell Itself

THE WALTON CO.

88 Allyn Street Hartford, Conn.



DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY

2201 N. 11th STREET ST. LOUIS, MO.

Progressive Notch, Pierce, Form and Cut-Off Die

(Continued from Page 26)

—Det. 21—4 units, size 4, 1.2 each 2.4
OPENINGS FOR PUNCH —Det. 12—4 units, size 1 .8
OPENINGS FOR PUNCH —Det. 26—4 units, size 4 1.2
All other PUNCHES have round ends.
OPENINGS IN STRIPPER:
PUNCH—Det. 21—12 units, size 4, 2 required 3.6
PUNCH—Det. 19—4 units, size 1, 2 required 1.6
PUNCH—Det. 12—4 units, size 1 8
PUNCH—Det. 9—2 round holes 6
PUNCH—Det. 7—4 units, size 1 8
OPENINGS IN DIE SHOE:
PUNCH—Det. 21—12 units, size 4, 2 required 5.4
PUNCH—Det. 19—2 round holes 6
PUNCH — Det. 12—4 units, size 1 8
PUNCH—Det. 7—4 units, size 1 8
PUNCH—Det. 2—2 round holes 6

TOTAL Column D .....136.1 hrs.

PERFORATORS, PILOTS AND CORRESPONDING HOLES
Column E—see Table and Drawings, Figs. 21-26
All PERFORATORS and PILOTS of Type 3 Construction
PERFORATOR—Detail 18 .. 2.0 hrs.
PILOT—Det. 17—2 required 3.0
PERFORATOR and PILOT HOLES—3 required 2.7
STOCK SPRING—(same as FINGER STOP), 1 required 3.0
FINGER STOP—1 required 3.0
AUTO STOP—1 required ... 4.0
GUIDE BUSHINGS FOR PILOTS—2 required 3.0
SPRING PINS—5 required 8.5

TOTAL Column E .....29.2 hrs.

(Continued on Next Page)

When you order or write about products described in TDM PROGRESS please mention the publication.

ASSEMBLY, TRYOUT, DEVELOPMENT	
Column F—see Table, Fig. 28 and accompanying text	
DIE—Dets. 16, 15, 14, 13, 1—1.5 each—to shoe	7.5 hrs.
STRIPPER—Det. 25	2.0
PUNCHES IN PUNCH PLATE:	
PUNCH—Dets. 21, 19, 12, 24—2.0 each	8.0
FORM PADS—Dets. 10, 11	4.0
PUNCH—Det. 7	1.0
INSERT—Det. 8	1.0
FORM PUNCH—Det. 26	1.0
PUNCH—Det. 2	2.0
PUNCH PLATE TO PUNCH HOLDER	4.0
PERFORATOR and PILOTS	1.5
GUIDE BUSHINGS	1.0
STOP BLOCK—Det. 20	.5
SINK IN DIE SHOE FOR PUNCH—Det. 24	2.0
DEVELOPMENTS FOR 2 DOUBLE L BENDS	5.0
TRYOUT	10.0
TOTAL Column F	50.5 hrs.
Estimated Hours of Labor Required	256.4 hrs.

NEW SERIES
VA-100-SP
Pilot Operated, Solenoid Controlled
HYDRAULIC VALVES
Virtually a 4-way hydraulic valve—meets requirements of very wide range of applications.

OUTSTANDING FEATURES:
1. Wide range of adaptability
2. Uses small, inexpensive solenoids
3. Compactness and accessibiiity
4. Simplicity of piping required

Full information on request

HYDRAULIC HI-SPEED CO.
5438-A Tiveman Ave. Detroit, Mich.
HYDRAULIC VALVES

To Our Many Friends and Customers

Greetings
of the Season

Tool, Die and Gage Makers
Precision and General Machine Work

STAR MACHINE & TOOL COMPANY
9320 WOODLAND AVE. CLEVELAND, OHIO
Detroit Representative: J. O. Stephenson 2618 Fourth Ave., Detroit, Mich. CAdillac 7261

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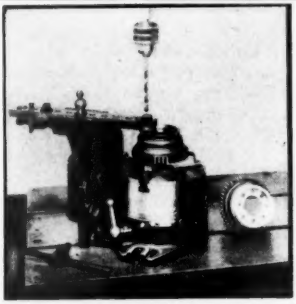
THE HARTFORD "SUPER-SPACER" with Drilling Attachment in Use

The DRILLING ATTACHMENT, which may be quickly secured to the base, has ample adjustment for jobs within its range and is ideal for drilling odd lots of flanges, hubs or other parts where spaced holes on a circle are required. Swings work 11" dia. Takes ASA removable bushings from letter O size drill to ¾". Saves many a jig on short run jobs.
The "Super-Spacer" is not only adaptable to so many tool room operations but its quick set-up, rigidity and fool-proof features make it practical for one piece or thousands.

Write for descriptive Circular CL-2.



THE HARTFORD SPECIAL MACHINERY CO.
281 Homestead Avenue
HARTFORD CONNECTICUT

Hovis Screwlock to Occupy New Plant

GEORGE A. VIS, president of The Hovis Screwlock Company of Detroit, informs us that the company's new plant will be ready by January first. Larger floor space and additional new and modern equipment will double the production of Hovis interchangeable punches, retainers and button dies.

The Hovis Screwlock was introduced about five years ago as an improved means of retaining "quick-change" punches. In both individual retainers and group plates, each punch is locked in place by a hollow head socket screw which passes directly through the retainer and into the punch shoe. This assures a direct, straight thrust-and-pull action with no side strain results. A partial turn of the screwlock with standard socket wrench releases punch.

Button dies are as easily retained by the Screwlock method and manufacture of group plates is greatly simplified.

Write Hovis Screwlock Company, 3129 Larned St., E., Detroit, Mich., for information in detail.

Equip your shop WITH **CHALLENGE** SEMI-STEEL **BENCH PLATES** *at Low Cost*

12x18" Size... ONLY— **$14** Five other sizes.

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICH.

SMOOTH, ACCURATE SURFACE

For layout, inspection, and assembly. Built of the best iron and steel with top, bottom, and all four sides carefully planed. Plate is 2-inches thick. Under side has heavy ribs. Write for data; also FREE CATALOG and prices on 4-inch Bench Plates, and 6-inch Layout Surface Plates, Lapping Plates, and other Challenge equipment.

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Denning Elected President

FRANK W. DENNING, president of the Denning Manufacturing Company, was elected president of the Northern Ohio Division of the Special Tool, Die and Machine Shop Institute at the annual meeting held in the Allerton Hotel December 11, 1940.

Harley L. Freeman, president of the Industrial Machine Company, was elected vice-president; and Emil P. Hahn again re-elected to the office of secretary and treasurer. The luncheon which preceded the meeting likewise was well attended.

Reports received from member shops in the Cleveland area indicate that machine capacity is quite well taken up although some shops have only one shift on duty.

Can You Use These Shop Facilities?

Die Making —

medium and large dies of all types.

Keller Machines —

medium and large.

Die Assembling —

experienced craftsmen with precision tools and inspection equipment.

If you are interested, write us and we will bring you together.

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Cleveland, Ohio

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Is this your Problem? Orders coming from all sides — facilities can't cope with situation — must do something about it — but where to start? — can't take men off present work — can't get more capable men.

If it's a production or engineering problem — a question of plant layout or more efficient production routine — put it in our hands.

Here is a staff of experienced engineers — representing diversified talents — all familiar with government requirements — that can take the load off your shoulders and give you expert help as long as you need it — without disrupting your present schedule.

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Designers and manufacturers of Special, Gair-Locking Blade and Standard end cutting tools for 24 years. Let us quote on your requirements—send us blueprints.

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Detroit, Mich.
Hi-Speed Tools, Ltd., Galt, Ontario

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AT 10,500 TO 50,000 R.P.M.
TYPE J-15

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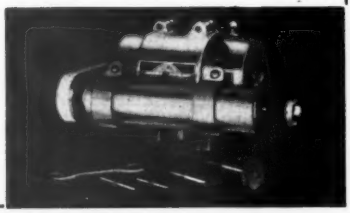

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Modern facilities for every type of designing and building service. Die Shop, Tool Room, Stamping, Assembly and Production work. All will appreciate inquiries for types of work indicated.

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GAGES—MACHINES—STAMPINGS
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Equipment includes:
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*See larger display advertisement also.

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SHEET METAL DIES, TOOLS, SPECIAL MACHINERY, DIE CASTING DIES
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Jig Boring—Planer Equipment

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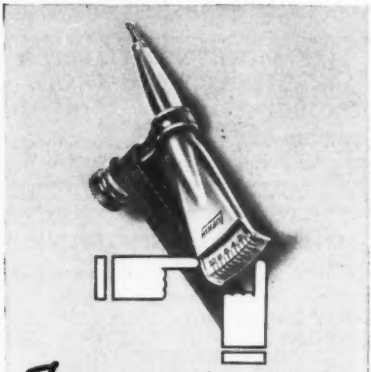

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And they're one reason why the Lufkin Universal Indicator is the outstanding Indicator of the day. Your dealer will show you. Write for Catalog.

THE LUFKIN RULE CO.

SAGINAW, MICH. New York City

Cont'd from Page 61

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"Let us be your tool room."
DESIGNERS AND BUILDERS
Tools, Gages, Dies, Jigs, Fixtures
Special Machinery
SWISS JIG BORING
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Designers and Manufacturers
Dies, Metal Stampings 250 tons capacity

Hamilton, Ohio

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Designers and Builders of
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The Hamilton Portable Elevating Table

New York City, N. Y.

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Machine Tools & Molds, Parts & Machines
Aluminum Cast Parts—Aluminum Sheet Formed Housings

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Economical Machine Work Done.
Let us quote on producing machine parts for you. We are equipped to do GENERAL MACHINE WORK *of all types.*

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★ Gorton hardened cutter blanks in both short and long sizes (from 1½" to 4") are available in both high-speed and special carbon steels. They are described in the new Gorton Accessories Catalog.
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George Gorton Machine Co.
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At Bench or Machine
WOVEN RUBBER MATTING
Reduces Damage and Breakage
Lessens Fatigue
Assures Firm Footing
Prevents Tracking
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STEEL LETTERS & FIGURES, NUMBERING MACHINES, MARKING MACHINES, STAMPS & DIES
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MARKING PROBLEMS INVITED
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Taft-Peirce Advances Rogers

ANNOUNCEMENT is made of the election of Walter E. Rogers to the office of Assistant Secretary of The Taft-Peirce Manufacturing Company, builders of machinery and tools, Woonsocket, R. I. Mr. Rogers was formerly Western Sales Manager with headquarters at Indianapolis.

Starting in February, 1921, as a salesman in the company's Indianapolis office, and subsequently in the Chicago office, Mr. Rogers left Taft-Peirce in June, 1923, to accept a position as Manager of the Small Tool Department of the Vonnegut Machinery Company. He returned to Taft-Peirce in April, 1927, and has been with the company continuously since that time.

Mr. Rogers, whose duties will be concerned primarily with the management of sales, is well known throughout the trade.

MR. YOUNG SHOP MAN—
See Page 55 for material to help you advance yourself in your shop work.

THE PRECISION UNIVERSAL TOOL HEAD brings all adjustments under absolute micrometric control without stopping tool or machine. In Jig Borer, Milling Machine or Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, undercuts, recesses, back faces and does an almost limitless range of "headache" jobs. Send for bulletins.

Removal Notice:
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ON THE JOB

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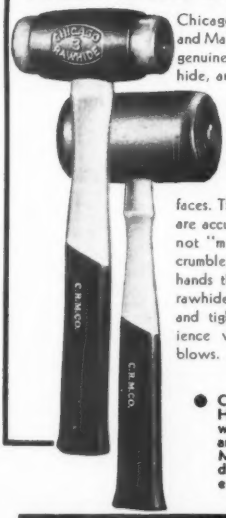
Tools with reputation



Chicago Rawhide Hammers and Mallets, manufactured from genuine Java Water Buffalo hide, are made by a firm with fifty years experience in producing quality products from rawhide. These tools make pounding safe on easily damaged surfaces. They are enduring. They are accurate. Rawhide does not "mushroom", crack or crumble. Even in unskilled hands they are safe because rawhide, tooled, compressed and tightly rolled, has resilience which cushions hard blows.

● **Chicago Rawhide Hammers are made with malleable heads and replaceable faces. Mallets are made in a dozen sizes to meet every requirement.**

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ALLOY
HY-TEN
STEELS

Immediate Shipment from Seven Warehouses

ALLOY
S. A. E.
STEELS

Reduce your tool and die costs with *Hy-ten "M" Temper, .70 Carbon Cr-Ni-Moly* oil hardening alloy steel. Extreme toughness at high degrees of hardness. Rounds, squares and flats in stock. Forgings of all types.

Send for descriptive folder

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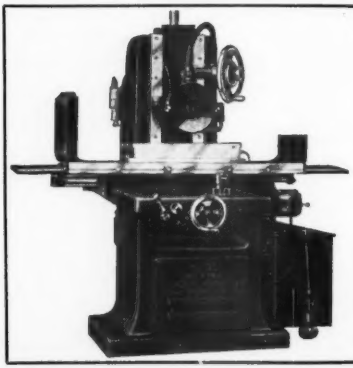
Kipp Air Grinders Speed Tool Finishing; Cut Die Building Time

The Kipp line of Air Grinders include four models—AG, BB, DD and the VT—all designed for use with the Kipp line of wheels, tips, points, stones, steel writers and cutters—to do any desired amount of grinding and cutting to any specified degree of finish in metals of a wide range of hardness. The AG and BB models are driven by air through the Kipp design of air ports and air turbine Kippcast onto the spindle. The exhaust air is expelled through the barrel, the escape ports located at the front enables the air to blow away the grinding dust from the work.

The AG in two series and the BB model in three series are particularly suited for tool room and die shop grinding or polishing out hardened parts for clearance or fit, for correcting small designing changes and for special fixture

set-ups. With the Kipp Tool Post Adapter many internal and external

(Continued on Page 65)



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SURFACE GRINDERS

Provide for Tool Room Accuracy at Production Speeds Built in Many Sizes

New Bulletin GL-100 on Request

GALLMEYER & LIVINGSTON
304 Straight Ave., S. W., Grand Rapids, Mich.

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Save your tools, your time, and your money by getting a well-built, long-lived Gerstner Chest.

Send for our Free Catalog.

GERSTNER TOOL CHESTS
56 Columbia St. Dayton, Ohio

Kipp Air Grinders

(Continued from Page 64)

grinding jobs can be done quickly and easily. Kipp Mounted Grinding Wheels up to ⅞" are interchangeable with both models.

Kipp Air Grinders operate at high speeds—40,000 to 65,000 R.P.M.—on air pressures from 30 to 120 pounds. All BB models are equipped with the Kipp Steel Finger Speed Control which is said to insure long life and greatest efficiency. The DD and VT models are larger tools designed for heavier work. Also in the line are an Air Chipper and an Air Filer with Chisels and Files for tool and die work.

A copy of "Kipp Air Tools," Catalog A.T. 2050, giving specifications and prices of the entire line of Grinders, Chipper and Filer and Accessories will be sent on request. Write Madison-Kipp Corp., 27 Waubesa St., Madison, Wis.

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The response of our readers has made possible a 35 per cent gain in advertising this year as compared to 1939.

THE HANDIEST RACK YOU EVER SAW

Greatest Capacity—Smallest floor space

4 arms, 51" high, stacks 10,000 lbs.; 5 arms, 57" high, 12,000 lbs. flat or round stock. 3 stands for 20' lengths; 2 for 12' or shorter. Use against wall or back to back in center of room. Cost is small, value big.

Write for circular and prices.

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Industry Today Demands Precision AND Speed

Cams cut by the old "Hit-or-Miss" methods are as outmoded today as hand grinding or filing.

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Deliver the actual movement originally conceived.

Eliminate experimentation.

Save design time; reduce shop, machine and man hours.

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"Cam Engineering Specialists"
227 Colonial Arcade Cleveland, Ohio

CAMS

Columbia TOOL STEEL

SHOP INFORMATION—

Often shop men do not have needed information on our steels.

Manufacturers are urged to make full use of literature which we have available for this purpose.

If we can help, call on us.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
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GENERAL OFFICE AND WORKS
410 EAST 14TH STREET • CHICAGO HEIGHTS ILL.

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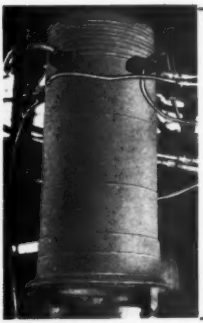

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FLAME HARDENING meets the demand for a faster, more efficient method of surface **hardening** producing **MAXIMUM HARDNESS** with **MINIMUM DISTORTION.** Rolls and Shafts made from carbon steels come out straight and hard. Gears of all types and sizes can be hardened without distortion. With our automatic controlled furnaces we offer a complete heat treating service including Nitriding, Chapmanizing, Aerocasing and the Heat Treating and Straightening of Bars.

24 Hour Service Call HEnderson 9100

The LAKESIDE STEEL IMPROVEMENT CO.
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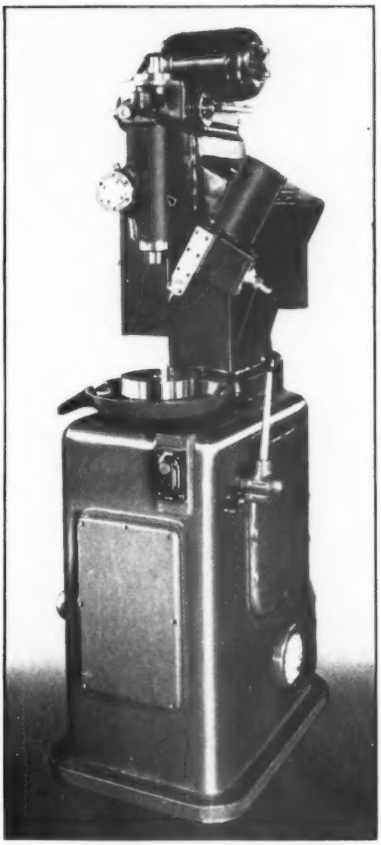

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